

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

OCT. 17, 1955

50 CENTS

Light Weight—Isochronous Governing

New Honeywell Hydro-Mechanical Fuel Control

ANOTHER quality engine control joins the Honeywell line with the introduction of the new Series 40 hydro-mechanical fuel control for gas turbine engines.

The new unit is designed to control fuel flow automatically on turboprop and turbojet engines with a fuel flow of up to 6,000 pounds per hour. It is operational to 60,000 feet with a ram ratio of 1.8.

The Series 40 Control is isochronous governing and features inlet air compensation—automatically correcting fuel flow for variations in inlet air temperature and pressure. It is unusually light and compact—under 10 pounds and less than 120 cubic inches. It was designed to be repackaged to fit any envelope.

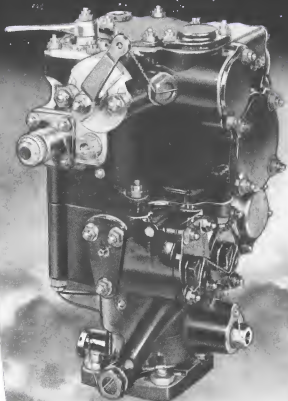
This exceptional new control is another in a long series of rugged yet precise airborne controls based on the experience and know-how of the world's largest manufacturer of automatic controls.

For complete information on this and other engine controls, write Dept. AW-10-156, at the address below.

MINNEAPOLIS
Honeywell

Aeronautical Controls

2600 Ridgway Road, Minneapolis 13, Minn.





Aircraft Heat Exchangers...

As performance requirements go up, Clifford's Wind Tunnel Laboratory assumes a major industry role.

The numerous heat exchangers illustrated on this page have one important thing in common. They all represent successful answers to heat transfer problems that haven't been solved until Clifford's Wind Tunnel facilities were put to work.

Each one of these heat exchangers represents a different problem—and some of them were highly unusual, involving designs for very high pressures within strict limits of space, weight and sometimes shape. In each case, Clifford designed and constructed the thermal valves that control the oil flow, producing a complete "package" ready to mount for service.

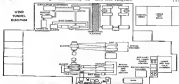
Units have been designed for many different applications, including engine control of engine line oil, hydraulic system fluids, afterburner lubricants, main, engine, gun and exhaust components as well as wing and component air-lane equipment. Aircraft needs of internal machine systems are type like oil coolers for jets to meet "high altitude" conditions, oil

coolers to meet the highly variable conditions encountered by turbo-propellers in their changes of flight direction from vertical to horizontal. The problems of rocket flight, including heat exchangers and the complex nature of rocket engines are currently receiving attention. The complexity in design plus the frequent problems of heat exchangers providing the handling of liquid metals for atomic energy applications.

In all these areas, Clifford's wind tunnel facilities for development and design plus production capacity to provide heat exchangers in needed quantities is your best assurance of securing the best solution to your problem.

A letter or phone call will put the world's most completely equipped technical service at your disposal to work on your problem. Clifford Manufacturing Company, 1720 Avenue Street, Wallingford, Conn. 06495, or Clifford's America Corporation.

Representatives: WAFBAG-51018, Russian offices in New York, Detroit, Chicago and Los Angeles. 11-01



Clifford's Wind Tunnel facilities provide capabilities for consistently reproducing the conditions encountered by aircraft in actual service on any part of the globe and at altitudes from sea level to 50,000 feet.



Resistant steel high temperature air-to-liquid exchangers. Clifford's ability to weld and braze stainless steel successfully, plus its unique test facilities give the company unusual advantages in the design of high temperature valves at aircraft heat exchanger applications.



How to put advanced heat transfer capacity into a restricted space is Clifford's R&D engineers' responsibility to provide answers per buying to the problem solved by the Clifford air exchangers.



Developed for the Westinghouse J46 turbojet engine, this oil cooler was first to supply the engineering principle in use of cooling service. It provided greater heat rejection capacity per unit of fuel flow than any previously known.



Both 707s and DC-8s

PAA Orders First U. S. Turbojet Fleet

New York to Paris, 6 hr. 15 min., New York to Rome, Rome, 11 hr., 15 min., Chicago to London, 6 hr., 45 min., Tokyo to Seattle 8 hr., 12 min. and Honolulu to San Francisco, 4 hr., 10 min.

The Boeing 707, powered by Pratt & Whitney J57 engines, will carry 104 passengers in standard first class; can operate at 125 ft. altitude. Each engine will cost just under \$7 million.

Douglas DC-8, with a wing area approximately 7% greater than the 707, is designed to carry 158 passengers in standard seating arrangements or 131 tourist class passengers. Pan American says the DC-8 will have "slightly greater range and will be equipped with a larger type Pratt & Whitney jet turbine engine," the P&W J75 (unannounced designation, J75).

Douglas said that its August announcement of the DC-8 performance was based on the J57, but "the Pan American planes covered by the present contract are designed to utilize jet engines of even greater power and velocity at sea when they become available for commercial use."

The DC-8 purchase calls for expenditures in excess of \$160 million for the 15 aircraft and spares.

For turbine engines and service flight mechanics will be added by the engineers, James Yopp, president of PAA, says. "The new jets will make little more noise on the ground than present propeller-driven jets. Run-off thrust will be used for braking effect after landing."

The order for jet aircraft does not effect the existing 588 million dollar 14 DC-7s with turbo-propeller engines. The first of these will be delivered in the spring.

The combined commitments, totaling \$167 million for new flight equipment, are evidence of Pan American's faith and confidence in the continued expansion of post-war transoceanic travel as well as greatly increased tourist travel between the United States and the 74 friendly foreign nations which are regularly served by the Pan American Clipper," Yopp stated.

Pan American is now somewhat about its long-standing, and perhaps still existing, order for the 50-1000 Comet 3s, in a statement to Aviation Week, the company said. "PAA has a continuing interest in the de Havilland jet program. Certain confidential written understandings exist between the two companies looking toward a successful outcome."

NEWS DIGEST

new last year. Freight shipments stood at 35% to 40% of total, equal to 27% to 1,275,000 tons and met up 6% to 2,007,000 tons. Late summer restrictions and school schedules are outlined for the first semester.

Slack Airlines carried a record 4,120-579 tons of freight on domestic scheduled service in September, 1959 more than the same month last year. Figures do not include the carrier's domestic and overseas charter flights. George M. Bass, Slack executive vice president, predicts a 50% increase in the airline's volume this year over 1954 and a 75% increase in airfreight for all airlines.

Wright Brothers Lecture will be delivered by Raymond L. Stephenson on Dec. 17 in the auditorium of the U. S. Chamber of Commerce Building, Washington, D. C. The lecture is sponsored by The Institute of the Aeronautical Sciences.

Classic Ship Nip Corp. of America reports \$1,100,750 profit after federal taxes for nine months ended Aug. 31.

Net sales totaled \$14,541,641 compared with \$17,086,419 for the same period last year. Freight sales were 25 cents of total sales. Freight sales were 25 cents of total sales. Freight sales were 25 cents of total sales.

Prototype Saab delta fighter, a 100% scale-up of the delta fighter, is scheduled to be flown at Linköping, Sweden. Developed as a result of light studies with the Ray half-scale Saab delta, the new multi-engine fighter is about 18 ft. long and has a span of approximately 15 ft. According to present estimates, orders for the delta will total some \$150 million and is designed to provide the backbone of the Swedish Air Force in the late 1950s and early 1960s.

Bosnia Radio setting its 39-odd old stake last week. In the International Association of Broadcasters (IAB) a six cent hourly raise with another on next increase to follow in September 1959. The union, which also serves as a pattern for at least part of the wireless industry, included in its new pay scale better and improved pension and insurance plans.



more miles for missiles

Out where the air is thin, where every ounce of dead-weight costs miles, rockets and guided missiles are reaching closer and closer to the fringes of space. Pastushin Force Ejection—product of years of specialized research—assures safe, positive ejection of missile, rocket, bomb and aircraft components.

 **PASTUSHIN**
AVIATION CORP., Los Angeles, Calif.

RESEARCH DESIGN—CONSTRUCTION—PRODUCTION

—Washington Roundup—

USAF Policy Speeches

Fiftieth anniversary session for top Air Force executives is in full swing, with eight top USAF public relations policy heads bowed from discussion of its problems in home and abroad. Here were their views last week.

• **USAF Secretary Donald A. Quarles** discounted street fears that GOP economic measures would curtail U. S. air power. He said, "There never was any question of abandoning our 117-wing program. Secretary Wilson is as determined as any man I know to develop and to maintain the best possible Air Force program." Quarles also warned the hue would it cannot rely because of peace talk, or it will find itself with an inferior air arm.

• **General Nathan F. Twiss**, Chief of Staff, said the Russians have numerical superiority over USAF but are not ahead of us in total air power. He said the Reds have more fighters than we have and their performance surpasses heavily with that of U. S. fighters, they outnumber us in light jet bombers but we have "many times more B-57s than the Soviets have B-5Ds." U. S. and Russia are about even in the heavy bomber field, where the B-52 is compared with the Red Union The B-36, were under better attack by the Navy and starting to phase out, "perhaps some day our other leader has left us have being attacked."

• **General Thomas B. White**, Vice Chief of Staff, in the most provocative speech, said that once the nuclear-missile might is perfected as a power and, the airplane may join the Air Force at a water-based border.

"It is conceivable," Gen. White said, "that a nuclear-powered, water-based aircraft may become an effective bombing weapon."

"Formerly, of course, water-based aircraft had neither the performance nor the capability to be used as Air Force bombers. However, new engine developments may enable the water-based bomber to take its place alongside other Air Force airplanes and aircraft."

"It was generally assumed that Gen. White's statement in relation to U. S. Navy's reported success in early flying tests with the new Mach 3.5 SeaStar, jet-fueled, fast Navy warheads already have pushed the PGM as a nuclear bomb-throwing aircraft, part of a standard team for nuclear war, including submersible and the new giant Farrel-still carrier."

"The Marine Corps is also working on new type of equipment for ground landing of airplanes, including landing and forward facilities that will be used by Navy units in the near future (AW Oct. 3, p. 17)."

Gen. White's tone of caution regarding performance of consistent with USAF's policy that "effective weapons—not useless nuclear" must make them as precise as possible. He said nuclear-powered aircraft will be phased out by the next ten years, but added:

"I must emphasize that in developing both the water-based missile and the nuclear-powered airplane, we could have these both sooner if we were willing to accept more problems and less effective performance."

Major value of the nuclear-powered aircraft, Gen. White said, will be an unlimited range and endurance, which will widen USAF's choice of targets. It would permit activation against an aggressor from any direction and increase the enemy's defense task. In addition, it would be its target in the enemy's long range missile.

Thereby, he said, "we would keep a huge

proportion of an atom-powered retaliatory force airborne all the time. It could be positioned to surround its targets immediately if an enemy were to launch an attack."

"Airborne and relatively invulnerable, it could be even an effective deterrent in an international balance of power."

Gen. White emphasized that actual Soviet development in the field of long range bombers has made America's air defense more important, with the use of America's job "related to Soviet aggression and its potential capability for aggression."

For instance, we need enough radar, fighter interceptors, and air defense missiles to effectively detect the latest attack as enemy is capable of mounting.

"The bomber production of a potential attacker is a factor in determining the number of air defense interceptors and radar we need. Whether he has 1,000 or 1,000,000 interceptors that we do is a factor in our air defense position because interceptors do not fight interceptors."

"The number of his interceptors is important, however, in determining the number of offensive airplanes we would need to sustain an air retaliatory attack," Gen. White said.

Army Losses Round

Watch for Army aviation programs to press next for revision of the three-year-old "maneuverability of understanding" that research was and types of aircraft it can use. Air Force involvement that would support is one of its missions recently led Defense Department to submit Army request for a new T-37 jet trainer for evaluation in basic and intermediate air. USAF also later traffic problems if ground forces start sending their own jets out on missions in the wake of battle where they could tangle with fighters out to bomb or strike enemy troops. USAF now has agreed to lead the Army some plans for tests, but it promised to stand firm against changes in the maneuverability.

Defense Contractors

The report as the 100 largest defense contractors closed last week by the Senate Preparedness Joint Committee Subcommittee (see p. 10) is only a first, perhaps very report. There will be other reports shortly dealing with different aspects of the maintenance of military business and the procurement policies Defense Department has followed with big companies.

Senate Banking and Commerce Committee headed by Sen. William Fulbright (D Ark.) is studying by itself the emerging subcontracting companies in studies. This contractor's interest in the other defense business has had on the economy in general and the stock market.

Airfields Down Under

Air Force speeches have departed for Australia and New Zealand to study airfields there to determine if they are adequate for use by B-57 observation planes which will make weather flights over the Antarctic. Included in the party were personnel from Spangley Air Command Headquarters.

—Washington staff

USAF Will Give Industry Secret Plans

ARDC will furnish firms advance technical data in effort to speed weapon system developments.

By Claude White

Washington—USAF's Air Research & Development Command, joining in the current effort to standardize any weapon system development by the aircraft industry, is preparing to release its secret Technical Program Planning Documents to a select list of contractors.

The program, not yet completed but due to get under way before the end of 1995, will be started on a "trial balloon" basis with a list of about 100 selected companies, universities and government agencies.

It will mark the first time secret USAF information on the military program to be based over the next 10 to 15 years, present capabilities, prohibitions and requirements has been made available to the industry.

Full details on the program will be disclosed by Brig. Gen. Thomas E. Borman, Commander of Wright Air Development Center, at a national meeting of the Institute of Aeronautical Sciences in Dayton, Ohio, Nov. 8.

Policy Implementation

Great importance is attached to the ARDC assistance program as one of the first concrete implementations of USAF's new policy of encouraging greater exploitation of aircraft industry development facilities. Lt. Gen. Clarence S. Davis, Deputy Chief of Staff for Materiel, already has announced that USAF will favor contractors who show achievement in the development field as well as a capability to produce (AW Oct. 16, p. 17).

In addition, ARDC is expected to oversee one of the industry's principal complaints: That USAF's grant contracts with security clear the heads of both prime contractors and component suppliers, keeping them from knowledge essential to intelligent and productive development programs.

The fact that security restrictions have been a stumbling block to further industrial research and development effort has been stressed by the Air Force in recent months. Trevor Cashen, Assistant USAF Secretary for Research and Development, told Aviation Week (Sept. 8, p. 14) that one company had

offered to start a new program with \$35 million if the Air Force would tell all it knew so that the money can be channelled into the most effective fields of research.

Another firm willing to build a laboratory at USAF will share the operating expense and share its secrets, Cashen said.

He feels that an ending of present security controls can be accomplished through the ARDC program, which will be based on the productivity of available R & D funds.

Lt. Gen. Thomas S. Prewitt, ARDC commander, said the need for faster development in "current and future developments" is a "real impetus of explosive development" (AW Aug. 22, p. 12).

The ARDC program was disclosed last week by Col. Terrell Dwydale, Chief of Plans and Programs at the command's headquarters in Baltimore, Md. He spoke before a meeting of the Washington section of IAS.

Dwydale said the program got its start about a month ago at the first of a series of Technical Program Seminars held in New York. Jointed contractors involved an outline from ARDC's guidance and control operations on recent state of research in which advances to new frontiers of science are essential.

Another topic, on aerodynamics and propulsion, will be held in Cleveland, Ohio, in February. By July of next year, Col. Dwydale said, ARDC plans to complete seven meetings, covering each of the command divisions and 40 different areas of R&D.

The program will be repeated annually.

Another major event on the ARDC schedule is an all-industry symposium to be held at the Baltimore headquarters last this year. Instead of the organizers and speakers meet concerned with R & D, that meeting will bring together the presidents of the major companies supplying USAF to consider policy matters.

The strategic purpose of an action, Col. Dwydale said, "is to expand the base of our research and development to the limit of our capability and ability, and make that all sources of the trust are working in concert."

Gerrity on Development

Los Angeles—Maj. Gen. T. G. Gerrity,

USAF Director of Procurement and Production Engineering, reported last week that the Air Force will announce development programs which will be offered to companies in performance in a further effort to keep pace with "the tremendous technological progress" of the Soviet Union.

Speaking before the Society of Automotive Engineers' Southern Production Forum, he said:

"We are not pursuing programs which offer only small incremental gains in performance. The search of such... goes... are two other efforts by training and education organizations aimed by new and more complex equipment."

To maintain G & S performance in an open, Gerrity said, the Air Force has decided that the pursuit of applied research and development will be achieved, that innovation will be the result of competition within the industry and that an effort will be made to shorten the time cycle between development and production.

He said that the program will be disclosed last week by Col. Terrell Dwydale, Chief of Plans and Programs at the command's headquarters in Baltimore, Md. He spoke before a meeting of the Washington section of IAS.

Dwydale said the program got its start about a month ago at the first of a series of Technical Program Seminars held in New York. Jointed contractors involved an outline from ARDC's guidance and control operations on recent state of research in which advances to new frontiers of science are essential.

Another topic, on aerodynamics and propulsion, will be held in Cleveland, Ohio, in February. By July of next year, Col. Dwydale said, ARDC plans to complete seven meetings, covering each of the command divisions and 40 different areas of R&D.

The program will be repeated annually.

Another major event on the ARDC schedule is an all-industry symposium to be held at the Baltimore headquarters last this year. Instead of the organizers and speakers meet concerned with R & D, that meeting will bring together the presidents of the major companies supplying USAF to consider policy matters.

The strategic purpose of an action, Col. Dwydale said, "is to expand the base of our research and development to the limit of our capability and ability, and make that all sources of the trust are working in concert."

He said that the program will be disclosed last week by Col. Terrell Dwydale, Chief of Plans and Programs at the command's headquarters in Baltimore, Md. He spoke before a meeting of the Washington section of IAS.

Dwydale said the program got its start about a month ago at the first of a series of Technical Program Seminars held in New York. Jointed contractors involved an outline from ARDC's guidance and control operations on recent state of research in which advances to new frontiers of science are essential.

Another topic, on aerodynamics and propulsion, will be held in Cleveland, Ohio, in February. By July of next year, Col. Dwydale said, ARDC plans to complete seven meetings, covering each of the command divisions and 40 different areas of R&D.

The program will be repeated annually.

Another major event on the ARDC schedule is an all-industry symposium to be held at the Baltimore headquarters last this year. Instead of the organizers and speakers meet concerned with R & D, that meeting will bring together the presidents of the major companies supplying USAF to consider policy matters.

seems, will compete in the production of new techniques and capabilities. Production contracts, Gen. Gerrity said, will be the result of those who make contributions and have production capability.

"Research and development programs in the field represent an approval of programs of research designed to produce these techniques and capabilities," Col. Dwydale said. He added that success can be measured only "by the economy and speed with which we carry out the program."

Floating Studies

The new and clean business suits included research centers of all kinds, including universities and government agencies such as the military services and National Advanced Committee for Aeronautics, he noted. He said, to make sure that ARDC plans are carried through.

They must produce what is needed, what it is needed and exploit the best of America's resources.

To make this kind of action, ARDC decided a series of studies which it will use the Technical Program Planning Documents. The command has divided R & D into 46 areas such as communications, human engineering and active acoustic detection. Each area is covered by a TPFD.

Each TPFD is under constant revision to keep it current and is made up of four parts:

- A definition of the military problem being solved by the technology, commitment and performance capability.

- A review and evaluation of present capabilities going at this point into the utilization of the scientific and technical of the R & D effort.

- A review of the technical prohibitions, data already known, proposed in research, sources of approach.

- A definition of the technical requirements as performance objectives. It is a demand on the appropriate ARDC center to achieve these objectives. The average number of technical requirements for each TPFD is three.

Distribution of the TPFDs to scientists, Col. Dwydale said, will allow the picture whose contractors "contribute to our qualitative requirements after the basic picture of USAF R & D effort had laid. They were not put into the picture in time to be put into its design, and so much of their valuable potential was not captured."

Col. Dwydale said that 100 contractors and agencies on the "trial balloon" list will be asked to sign agreements before they are given the TPFDs as well as they are interested. These will deliver scientific cooperation, help for security and in the field of proprietary information. The one

contractor will agree to surrender the documents at any time his eligibility is changed.

ARDC, and distribution of the TPFD is not a request for proposals.

'Rough the Rest'

After the first experiment at a planned to expand the program to all interested companies and agencies. Eventually, ARDC intends to "rough the rest of U.S. engineering talent" in distributing the information to small companies who can meet the requirements. These will include:

- Special security clearance.
- Sound evidence that the field of interest is suitable.
- Known capability in the field.

Air Defense Radar, Civil Traffic Systems Joined in Boston Test

By Probke Stever

Washington—Integration of an air defense radar and civil traffic control in a test being in the Boston area, was ordered last week by the Air Commanding General. Ultimate objective of the test is to establish the first all-around network between Boston and Norfolk, Va.

The action followed strong criticism of the Civil Aeronautics Administration's traffic control system by military and civilian officials (AW Oct. 16, p. 17). Lt. Gen. Joseph Smith described the present system as "inadequate and obsolete."

Observing and the action was due to the decision of CAA to incorporate present facilities of the military into a common system with civil equipment. That added that the ACC system may have shown a stagnation of CAA.

Under present circumstances, the decision to provide a more common civil-military system.

The plan for the Boston area was the result of a joint study by the Air Force, Navy, Air Navigation and Development Command and Civil Aeronautics Administration. Headquarters for the operation will be at West Island, an Air Force installation near Boston and the operation will be handled by a CAA station team.

Test Goals

The experiment includes four factors:

- Research and development on a trial to control system and elements.
- Test and evaluation on air traffic control system.
- Control of air traffic by CAA according to the development and evaluation.

From ARDC's viewpoint, basic motivation for the program is a few test areas, Col. Dwydale said. "That our better military, especially cannot be seen by the greater flood of war material which has played in large part in our military operations in the past."

Quality now is more essential.

He added: "The bulk of our production of quality has been achieved by American industry. However, the purpose of our production of quality must be achieved by American industry."

It is in this (this) industry that we are endeavoring to achieve for Air Force industry team at efficiency as possible.

Air Traffic Meeting

An Air Traffic Development Board in cooperation with the Civil Aeronautics Administration is planning an industry-government symposium on the problems and requirements of the air traffic control system.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ANDB has been assigned the responsibility of modifying a joint CAA with any research, development, test and evaluation on air traffic control system and elements.

ing system (TRACAL) which is directly concerned with information from the SAGE system. Possible integration of ATC and the SAGE system will also be considered.

By using a combination of CAA and military long range radar the coverage will be extended north to the Portland, Augusta, Me., area, south to Cape Hat, Texas, N. C., and west to Blackhawk, W. Va., Martinsburg, W. Va., Wheelersburg, Pa., and Sacramento, N. Y.

CAA Liberalizes Airport Aid Policy

Washington—A new policy calling for more liberal standards in the administration of the federal aid airport program has been proposed by the Civil Aeronautics Administration.

These changes will be the elimination of the strict \$500 annual permit per sq. ft. based on a standard and the restrictions against use of federal funds on terminal buildings.

Formerly, an airport had to meet the \$500 per square foot criterion in order to be eligible for federal aid. A more liberal standard will judge eligibility on the aviation needs of the community served and will give the CAA considerable flexibility in deciding which communities should get government money for their airport projects.

Ending of the controversial prohibition against use of federal money for terminals will help construction in the development of their passenger and cargo handling facilities, although the CAA is expected to insist that money used for terminal construction and for other projects be jointly raised at local government and federal expense.

The CAA has already appropriated \$10 million for fiscal 1956. \$46 to be allocated in \$42.3 million appropriated by Congress as part of the fiscal year 1957. CAA's program. CAA is expected to announce allocations shortly after Jan. 1.

Under the new program, CAA can make allocations for future years, but the program allocated will probably try to keep the majority of its projects on a one-year basis.

Along with the new flexible standards for airport eligibility, CAA will have standards for the development of new airports. New facilities will be eligible in cases where a community poses the need for one or where one airport could serve two or more cities better than several facilities. Additional airports can be authorized for communities where existing facilities are inadequate or cannot be economically expanded. When an airport gets past the mark of 100,000 passengers a year, a potential need for another airport exists.

ADC Interceptors Being Fitted With Falcon Air-to-Air Missiles

By William Coupland

Yankee Air—Interceptor aircraft of the Air Defense Command soon will be equipped with the Hughes Falcon GAIK air-to-air missile. It was unveiled at the close of the 1955 fighter weapons and tactics meet.

Air Force interceptor pilots will begin training with the Hughes-built guided missile this early next year.

USAF's current stock of interceptors, the North American F-102, Lockheed F-96C and Northrop F-86D, will be equipped with rockets as well as Falcon missiles during the training program. Convair's F-102A, soon to be phased into the program, is designed to carry the missile.

To provide targets capable of altitude and speed which will test the performance of the Falcon-equipped interceptors, a squadron using Ryan Q-2 drones will be assigned here within a few months.

"Currently, use of the drone will be expensive but so is the Falcon," said a high ranking USAF official.

Every Air Defense Command pilot will fly at least one, and possibly two, Falcons during his annual training period at Yankee AirB. Falcons will give the pilots a wider access, limit from the 3-75 altitude for rockets now in use.

Major B-77 Conner will phase into service here in target tow ships, further enabling interceptor pilots to fire in training at altitudes higher than is possible with the North American F-102 and Boeing B-70.

Plans to step up training in both rockets and air-to-air missiles were revealed at the conclusion of a rocket meet, held at Northrup's plant, somewhat disappointed to the score.

"We are not too good yet," commented Col. Robert F. Wadley, commander of the training base.

First place in the rocket meet went to a team from Eastern Air Defense Force, firing Lockheed F-94C Starfires EADP scored 11,680 points out of a possible 24,000.

In second place with 10,000 points was an Air Training Command team flying North American F-86Ds. Northrup Air Command, flying Northrop F-86Ds, scored 9,000 for third. Results of the fighter weapons phase of the meet, held at Northrup's plant, Las Vegas, were reported in *Airman's Week*, Oct. 16, p. 77.

Manufacturers noted said the Hughes Aircraft E-4, E-5 and E-6 fire control systems installed on the interceptors showed improvement over last year's test.

"It had a 'long way to go' in reaching acceptable reliability."

Col. Wadley estimated that the great majority of "misses" as the test was called, did not occur on the part of the pilot or ground controller, but to a serious malfunctioning of the fire control systems. The test scores indicate that remains a considerable problem.

Air Force maintenance crews are a long way from mastering the intricacies of maintaining the fire control system, he said.

Commenting on the Hughes system he added: "As weapons go, this is still reliable now. We're still in the process tactically of knowing to walk with it."

During the meet, interceptor pilots were required to go under the hood at 14,000-ft., make all firing passes "blind," and remain under the hood until returning to the 14,000-ft. level. F-102s equipped with the fire control system from C-51 equipment had it wired all during the meet.

Firing was at 9 ft. x 45 ft. Radar reflecting coils targetposts targets tested at 180 ft. low ranged at altitudes of 13,000 and 10,000 ft. Aircraft were limited to 24 rockets in each mission.

"If the F-102 could hit 104 rockets, it probably would score 100 per cent," Col. Wadley said.

Hughes Stepping Up Falcon Production

Tucson—Hughes Aircraft Co. is stepping up production of the USAF's Falcon air-to-air missile from its present rate, believed to be in excess of 190 per cent, according to company officials during a recent visit to the Hughes plant here.

Present cost of the Falcon is estimated to be between \$25,000 and \$27,000 each. The figure is expected to drop to \$10-15,000 within the next year or two.

Employment at the Hughes Tucson plant is nearly 4,000, 50% above last year.

It is scheduled to reach 4,500 by the end of 1956. Another indication that Falcon production is being increased significantly is the recent addition of 15 more subcontractors. When new and old subcontractors last next year, subcontracting will supply nearly 50% of the Falcon production effort.

Despite the general introduction of production in the avionics industry, Hughes Aircraft's employment, facilities and sales have increased since October 1955.

USA's FALCON AIR-TO-AIR MISSILE, now in mass production at Hughes' Tucson plant, has built a solid production system.

Wren's original cost in 1955. The company now expects 15,000, up from 10,000, while floor space is up from 2.4 million to 3.1 million square feet.

Sales this year will run "somewhat more than \$200 million," a company official said. The figure was slightly less in 1955.

These figures indicate that Hughes has recovered and stabilized from the mismanagement troubles which shook the company two years ago (AW Sept. 25, 1954, p. 18). Hughes credits that it has produced more than 5,000 interceptors for military orders at its main Culver City (Calif.) plant, 5,000 of which have been turned out since Jan. 1954. This equipment, widely reported as the only one last week, was reported in *Airman's Week*, beginning more than three years ago (Feb. 25, 1951, p. 69).

At this time *Airman's Week* is reported.

"The interceptors' most will then track the target, providing... information (which) will be fed to a computer which instantly calculates what path the airplane should fly to intercept the target."

"Signals from the computer will go to the autopilot which will quickly maneuver the airplane onto the desired flight path."

"Which more advanced guided missiles than the Falcon are very close to production," a Hughes official said. There are under development at Culver City, although the company is transferring all missile production engineering facilities to Tucson.

Special test equipment, developed by Hughes for checking Falcons under simulated flight conditions, cost \$15 million, a major defense item, than the combined cost of the Tucson plant and its auxiliary tools.



LEAVING THE NEEL, a group of Falcon shots in shipping cars will be used for flight test purposes, as evidenced by the following unknown (above shot) mounted on a mobile platform of the test. Reliable sources report that the Falcon missile is capable of operating well into the upcoming next stage.

USAF Orders F-104As

Burbank, Calif.—A contract valued at more than \$200 million for new F-104As for fighters for the Air Force was awarded last week at Lockheed Aircraft Corp. The prototype 209.104 started its flight test in February of 1954 and at present is flying at Edwards Air Force Base.

Congress Starts Study Of Automation Effects

A study of the effects of automation and technological developments on the industrial structure of industry and labor organizations has been started by the Joint Congressional Committee on the Economic Report.

Heavily backed by a memorandum issued by Ray Wright (D-Ten.) has been scheduled for this week and next week. Witnesses in turn on automation in the electronics industry are Don Mitchell, president, Motorola Electric Division, Detroit; C. T. Ward, president, Standard Carbon Division, General Dynamics Corp., and Chas. B. Bowers, director, Engineering Research and Development, General Mills. Other witnesses include Vincent E. Smith, president, General Investment, Ralph Condit, president, General Electric Co.; Sheldon Holt, vice president, Burroughs Corp.; D. Z. Davis, vice president, Ford Motor Co.

Propeller Reversal Blamed in Crash

Crews of a United Air Lines DC-6 shortly after take-off on a training flight from New York's McArthur Field Apr. 5 were probably due to the unintentional reversal of one throttle into reverse engine, according to Civil Aeronautics Board's accident investigation report.

With the other three engines operating at high power levels, the aircraft quickly became uncontrollable and crashed, the report said.

Three pilots were killed. Capt. R. C. Bly, 404, New York area flight instructor, is considered, and Capt. W. R. Wicks and H. M. Dwyer, should they provide instrument proficiency check.

Evidence indicated that the one throttle was moved out of reverse by the pilot into the forward position in an attempt to increase, the report said, the reverse warning flag was not lifted, resulting in increased reverse thrust. There was insufficient time to shut off the pilot corrective measures to become effective.

Defense Dept. Top Contractor List 'Misleading,' Sen. Johnson Charges

Washington—The Senate Preparedness Investigating Subcommittee issued a list of the 100 largest defense contractors, charging that an earlier list released by the Department of Defense is "misleading." The subcommittee's Sen. Lyndon Johnson (D-Tex.), chairman of the subcommittee, said that his group "feels a complete and accurate picture of these awards should be made available to the public."

He said the subcommittee concluded that the Defense Department report on the major contractors "made it impossible to determine who currently were the largest defense contractors and that methods used in collecting statistics clearly misled review and misleading as a result of errors made in compilation."

Major differences between the two lists, Johnson's subcommittee does not include General Motors Corp. as one of the top 100, the Senate subcommittee puts GM at the top of the list with over \$6.4 billion in defense business. A supplement to the department report shows GM with a "new" \$55.4 million in defense business.

Forty-five other firms not listed in the department's "100" but still appearing in the subcommittee's include General Corp., Waltham, Mass.; General Corp., Norwalk, Conn.; McDonnell Aircraft Corp., St. Louis, Mo.; and Bell Aircraft Co. The Senate list Chrysler has the 90th largest release of defense business, \$10,000,000; Northrup, \$10,000,000; and Bell, \$10.

The main reason listed for the difference is that the Defense list covers the period from 1948-1953 through 1954 (Apr. 30, 1954), while the Senate list begins with the military construction program in and 1950.

Defense Explanation

The Defense Department generally denied the charge that its report of last May was misleading. Defense said that a "cover sheet on the analysis of large military prime contractors" May 16, 1955, states "General Motors, for example, undoubtedly is still one of the largest suppliers of military equipment. It is certain that many of the largest companies are still among the largest suppliers in terms of current production."

The committee referred to are large suppliers which were not listed on the report for the reason that contractors and transportation people or wholly owned subsidiaries avoided their listing this period.

"... The report was prepared in response to a specific request of Sen. Fulbright who expressed a particular interest in the awards to large suppliers during the 18-month period covered by the report. The subcommittee's investigation for General Motors and other large suppliers exceeded our needs during the period was significant information and appropriate to Sen. Fulbright's study of the stock control."

Report 'misleading'

"It is erroneous," the Senate subcommittee maintained, "that are statistical errors made in preparation of a statistical list if it is to be of any real usefulness. Otherwise the data cannot be of value for comparative purposes and much important information is lost or suppressed."

The Defense report was "misleading" said the subcommittee complained, because while "purporting to cover only the 18-month period from mid-1953 through December, 1954, it did eliminate from the aggregate contracting list the large percentage of contracts actually awarded prior to the period."

The subcommittee also charged that by using mid-1953 as a starting point, the Defense list "produced a further misleading overall picture" by failing to show heavy procurement during the six previous months, starting January, 1953, when the Eisenhower Administration started. During this period, the report said, contracts are awarded: Ford, \$10,000,000; Northrup, \$10,000,000; and Bell, \$10.

The Defense Department itself is responsible, as it was charged, it was charged to do so by two congressional committees—Senate Banking and Currency Committee and the House Small Business Committee. The department had decided to disregard the request for "accuracy" during early stages of the end 1950 to mid-1953 period as January, 1954. The list of defense contractors had previously been issued over six months.

The Banking and Currency Committee, headed by Sen. William Fulbright (D-Ark.), based the department's report over to the Preparedness Subcommittee for evaluation.

Observing that "the domination of defense industry among producers has long been a subject of considerable interest, not only to the Defense Department and businessmen generally but also to Congress, other government agencies, and the general public."

100 LARGEST DEFENSE CONTRACTORS

This is the list of companies with the largest volume of military business prepared by the Senate Preparedness Investigating Subcommittee.

Rank	Company	Total Contracts	Termination and Cancellation (in millions)	Net Value	Rank	Company	Total Contracts	Termination and Cancellation (in millions)	Net Value
1	General Motors Corp.	\$7,471.0	\$635.0	\$6,836.0	48	United States Rubber Co.	208.0	9.5	\$196.5
2	Boeing Aircraft Co.	5,471.9	524.1	4,947.8	49	Ford Motor Co.	206.0	92.3	\$194.0
3	Chrysler Aircraft Corp., Inc.	4,180.3	219.7	3,960.6	50	Armstrong & Freebody Co.	205.9	84.3	\$191.4
4	United Aircraft Corp.	4,150.0	375.3	3,774.7	51	Continental Can Co.	205.9	1.1	\$183.2
5	General Electric Co.	3,048.0	376.4	2,671.6	52	Armstrong & Freebody Co.	205.9	1.1	\$183.2
6	Lockheed Aircraft Corp.	3,077.0	161.1	2,915.9	53	Stevens & Co., Inc.	205.9	1.1	\$183.2
7	North American Aviation, Inc.	2,988.0	46.4	2,941.6	54	United Fruit Co.	205.9	30.6	\$176.0
8	General Dynamics Corp.	2,869.4	119.4	2,750.0	55	Booth Aircraft Corp.	205.9	3.3	\$163.0
9	Rockwell International Corp.	2,834.0	137.0	2,697.0	56	United Fruit Co.	205.9	30.6	\$176.0
10	Overseas Corp.	2,600.0	511.1	2,088.9	57	Federal Can Co.	205.9	23.0	\$161.9
11	Corbin-Wright Corp.	2,097.6	6.3	2,091.3	58	Swift & Co.	205.9	1.1	\$161.9
12	Armstrong Telephone & Tele. Equip. Co.	1,916.6	160.7	1,755.9	59	Black Alliance Contractors	205.9	13.5	\$151.0
13	Tenneco Corp.	1,826.3	163.3	1,663.0	60	Aluminum Co. of America	205.9	1.1	\$151.0
14	Chrysler Aircraft Corp.	1,810.0	47.6	1,762.4	61	Booth Aircraft Corp.	205.9	3.3	\$163.0
15	Boeing Aircraft Corp.	1,715.3	30.3	1,685.0	62	Continental Can Co.	205.9	1.1	\$183.2
16	Westinghouse Electric Corp.	1,683.1	42.1	1,641.0	63	Sylvania Electric Products, Inc.	205.9	12.7	\$153.2
17	Sperry Corp. (The)	1,739.0	47.3	1,691.7	64	Armstrong & Freebody Co.	205.9	84.3	\$191.4
18	Northrup Aircraft, Inc.	1,700.0	61.8	1,638.2	65	Armstrong & Freebody Co.	205.9	84.3	\$191.4
19	Hughes Tool Co.	1,683.1	179.3	1,503.8	66	United Fruit Co.	205.9	30.6	\$176.0
20	Martin Marietta, Inc.	1,683.1	11.8	1,671.3	67	United Fruit Co.	205.9	30.6	\$176.0
21	Eastman Kodak Co.	1,683.1	11.8	1,671.3	68	United Fruit Co.	205.9	30.6	\$176.0
22	Northrup Aircraft, Inc.	1,683.1	11.8	1,671.3	69	United Fruit Co.	205.9	30.6	\$176.0
23	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	70	United Fruit Co.	205.9	30.6	\$176.0
24	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	71	United Fruit Co.	205.9	30.6	\$176.0
25	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	72	United Fruit Co.	205.9	30.6	\$176.0
26	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	73	United Fruit Co.	205.9	30.6	\$176.0
27	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	74	United Fruit Co.	205.9	30.6	\$176.0
28	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	75	United Fruit Co.	205.9	30.6	\$176.0
29	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	76	United Fruit Co.	205.9	30.6	\$176.0
30	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	77	United Fruit Co.	205.9	30.6	\$176.0
31	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	78	United Fruit Co.	205.9	30.6	\$176.0
32	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	79	United Fruit Co.	205.9	30.6	\$176.0
33	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	80	United Fruit Co.	205.9	30.6	\$176.0
34	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	81	United Fruit Co.	205.9	30.6	\$176.0
35	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	82	United Fruit Co.	205.9	30.6	\$176.0
36	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	83	United Fruit Co.	205.9	30.6	\$176.0
37	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	84	United Fruit Co.	205.9	30.6	\$176.0
38	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	85	United Fruit Co.	205.9	30.6	\$176.0
39	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	86	United Fruit Co.	205.9	30.6	\$176.0
40	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	87	United Fruit Co.	205.9	30.6	\$176.0
41	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	88	United Fruit Co.	205.9	30.6	\$176.0
42	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	89	United Fruit Co.	205.9	30.6	\$176.0
43	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	90	United Fruit Co.	205.9	30.6	\$176.0
44	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	91	United Fruit Co.	205.9	30.6	\$176.0
45	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	92	United Fruit Co.	205.9	30.6	\$176.0
46	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	93	United Fruit Co.	205.9	30.6	\$176.0
47	Boeing Aircraft Corp.	1,683.1	11.8	1,671.3	94	United Fruit Co.	205.9	30.6	\$176.0

(Continued on page 17) Total figures include all contracts, procurement, but does not include all of the production of General Dynamics Corp. for the period.

will be the committee's second consideration of regular release of lists of 100 top contractors by Defense Department, since mid-1950 as starting point for "accuracy" during early stages of the end 1950 to mid-1953 period as January, 1954. The list of defense contractors had previously been issued over six months.

The Banking and Currency Committee, headed by Sen. William Fulbright (D-Ark.), based the department's report over to the Preparedness Subcommittee for evaluation.

Observing that "the domination of defense industry among producers has long been a subject of considerable interest, not only to the Defense Department and businessmen generally but also to Congress, other government agencies, and the general public."

NBAA May Finance Development Of Modern Executive Transport

By Edwin J. Balaban

DETROIT—The National Business Aircraft Association is what it calls the "back-dragging" factor of U.S. aircraft manufacturers' reluctance of underwriting the development of a high-speed transport especially designed to fit executive needs.

The problem of just how to get modern executive jets off the drawing boards and into the air will be the first agenda item to come before the association's new executive advisory committee at its initial meeting in New York City next in December.

The committee is composed of 15 members of several U.S. corporations. Henry W. Boggs, who was elected president of the association at the meeting, and the committee would have no difficulty in raising the large sums needed to subsidize the development of a transport prototype.

Boggs also revealed a plan to decentralize NBAA activities in order to deal with on-the-spot local problems, particularly those relating to airports, more effectively.

Industry Interest

Despite unfavorable flying weather, official registration of the annual meeting totaled 517, the largest in NBAA's history. (495 showed up at Dallas last year and 127 appeared at the 1955 meeting in St. Louis.) The association also reported a 21% increase in membership since its Dallas meeting last year, for a total of 103 corporate members operating 180 planes.

Industry interest in this article and back-dragging factor was indicated by the representation of approximately 70 firms at the meeting.

The increased transportation for the business plane owner's dollar was evident from the display by North American Aviation, Inc., and Fairchild Airplane Division of new turbine-powered transport proposals. Representatives of the firm were busy collecting pilot and owner opinions on various design and operating features of their proposals. The NBAA question, however, was where, and if, these planes would leave the drawing board.

North American powered turboprop and turboprop-powered designs with these common features:

Eight passengers normal seating on partly (15 passengers in the high-density version), cabin pressurized to approx-

imately 5,000 ft.; 1,500-station-mile range; five-mile landing gear; thermal protecting fair wings and tail, and 75 in. stand-by head room. The airplane's size was said to fall between that of the Lockheed L-1049 and Douglas DC-7.

The placard accompanying the display said the planes could be available to purchasers 30 months after the firm received a go-ahead to produce.

The back-dragging design was placed around two Rolls-Royce Daris, and would have a gross weight of 21,500 lb. Operating altitude would be 30,000 ft. Initial cost was given as \$480,000 and operating cost for 1,000 hr. at \$60/hr.

North American's turboprop showed a gross weight of 16,000 lb., an operating altitude of 45,000 ft., initial cost of \$550,000 and direct operating cost of \$18/hr.

However, industry observers at Detroit noted that North American reportedly has designed a turboprop twin jet trainer for the Air Force which could push development of its business plane studies back at least temporarily.

Fairchild's Design

Fairchild's new project, a development of the M-125 proposal (AW Feb. 25, p. 16; Aug. 15, p. 122), showed some changes over the original design.

The company has increased the wing area from 210-sq. ft. to 325-sq. ft. to increase jet fuel storage and provide over 1,000 gal. internally. With added fuel, external fuel, the new M-125 could carry 7,300 gal.

An important change is planned in the powerplant layout. Originally scheduled for four jets at the Fairchild 244 class, the new proposal would have three engines, all placed in the tail. Company spokesmen refused to talk about the new powerplants except to say that they are different types still in the MX-600 state.

We get the impulse off to an early flight test program prior to availability of the new MX-600 engines, the prototype will be powered by two Westinghouse turbojets 7,500 lb. thrust, in accordance of the approximate thrust of the advanced powerplants planned.

Industry observers at Detroit reported that Roper Aircraft Corp. is another contender in the turbine-powered executive transport field. Republic Aircraft Corp. is also mentioned as having finished a DC-3-type design powered by two Rolls-Royce Daris.

Company officials say they now have

orders for some 40 turbo installations to date, many of them for business aircraft.

Forum Discussions

Safety awards levanted the annual Recognition of flight safety records achieved by corporations and pilots entered up the heavy flying activity by U.S. companies. The awards included:

• **John P. Gary**, vice president general manager, Borch Aircraft Corp., Wichita, Kan., received the 1954 Annual Business Flight Safety Award of the Women's Aeronautical Association of Kansas. Presented for the first time, the silver cup recognized Gary's safety promotion efforts since 1934.

• **Million miles safety awards** were given 75 officers of NBAA-member companies who have flown a total of 14,379, 225 plane-miles without accident.

• **100,000-company-mile safety awards** were granted 14 NBAA-member pilots who have accumulated a total of 37,636,774.5 accident-free plane-miles.

• **Milestones safety awards** were given 79 member corporations whose aircraft have one million or more accident-free miles. These represented a total of 37,490,167 mile plane-miles.

The need for exchanging information relating to administrative, maintenance and operating problems was indicated by the heavy emphasis on these phases of business plane operations.

It was obvious that because of the individualistic operation of hundreds of business aircraft operation using a wide variety of greatly modified aircraft, there is a big need for standardizing overhead expenditures if costs are to be reduced.

Fuel-bank operations and that, with labor costs mounting about \$4.50/hour, they are likely to make three percent profit after taxes. Many pilots complained that aircraft down-time often greatly exceeds initial estimates.

The maintenance representatives said that one of their big problems is getting a detailed specification from the plane owner sufficiently in advance to schedule the timing of parts. Due maintenance expense and their own DC-3 and L-1049 fleets now make 80-120 days to process. Another said he thought that he should have detailed specifications on the work to be done on an airplane a minimum of 120 days before the craft arrived at his shop.

In addition to the application of Boggs as NBAA president, Walter C. Payne, Arizona Steel Corp. captain, was named national vice president. Gerald P. Roper, International Harvester Co. was selected treasurer and Fred De Bogue was selected executive director.

New members of the board: Curtis G. Talbot, General Electric Co., and Robert Sprague, Jr., Sprague Electric Co.

Reliability



GOVERNMENT PRODUCTS DIVISION

Just as success sailed with John Paul Jones on the thundering, blood-soaked decks of *The Ranger* and *The Bon Homme Richard*, so in every major conflict in this day his victory crowned the value of our fighting men. Reliability in men and machines was, and is, the security of our nation. At Rheem, we, too, are proud of the reliability of our men and machines and the enviable record of low per unit cost and on-time completion schedules assured in our role as prime contractor to the United States Government and sub-contractor to other industry leaders.

The Government Products Division facilities of Rheem are presently in quality development and production on air frames, tanks and jet-propulsion components, airborne industries, electronics and ordnance material.

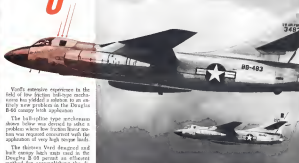
YOU CAN RELY ON RHEEM

Rheem Manufacturing Company • GOVERNMENT PRODUCTS DIVISION

DOWNEY, CALIF. • SAN PABLO, CALIF. • WASHINGTON, D.C. • PHILADELPHIA, PA. • BURLINGTON, N.C.



Secured



Vard's extensive experience in the field of low friction ball-type mechanisms has yielded a solution to an entirely new problem in the Douglas B-60 canopy latch application.

The ball-type type mechanism shown below was devised to solve a problem where low friction linear motion was required concurrent with the application of very high torque loads.

The fixture Vard designed and built energy each axis used in the Douglas B-60 permit an efficient method for accomplishing the diverse requirements of simple manual operation, effective locking for pressurization and accommodation for emergency ejection.

Your mechanical application which requires low friction linear translation in association with high torque loads will be studied promptly by Vard engineers upon receipt of your inquiry.

The Douglas B-60 shown above is the U. S. Air Force's latest twin jet bomber. First flown in June, 1954, this airplane plays an important part in the new concept of Tactical Air Operations.



* CANOPY LATCH SHOWN FULL SIZE



CLOSED CIRCUIT LINEAR BALL SYSTEM



FRAY WAT. LITTLE POINTS LOW LINEAR FRICTION UNDER HIGH TORQUE LOADS

FIRST in mechanical actuation

VARD
PASADENA 4, CALIF.

Exclusive Sales Representatives
New York City Dayton Ohio

2911 EAST COLORADO STREET, PASADENA 4, CALIF.

Federal Contractor Policy Scored

Washington—The Defense Department's order to limit contractor payments to 100% of incurred costs (AW Sept. 26, p. 15) actually is "an effort to judge the shortcomings of government internal cost administration," the National Security Industrial Assn. has charged.

The Department's aim, to cut back on the need for substantial advance price revision shows a contractor has collected more than his product is worth, could be achieved by work-contract changes, according to NSIA. At the same time, NSIA said, the system would avoid financial and administrative hardships that will result from the department's directive that went into effect last month.

NSIA Objectives

In a letter last week to Kenneth T. Robinson, Jr., Deputy Secretary of Defense, NSIA listed three objectives to the directive.

- It will leave the government nearly always in debt to the contractor.
- It is arbitrary and inequitable, adds to the mounting burden, deprives the contractor of earned funds.
- It will not speed the pricing process, which now takes more than a year because of administrative delays by the contractor.
- It is impossible for most contractors having price-variation or incentive-type contracts to certify their costs on a day to day basis.

• It is feared that the effect of the directive will be to convert fixed-price contracts into cost-plus contracts, thus increasing auditing and administrative work.

• It is feared that the process of getting a price revision incorporated in a contract will take longer when additional payments usually are due the contractor.

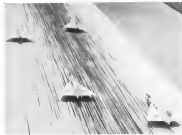
In a letter to Robinson, NSIA said that the September directive is similar to a Navy instruction issued last July. The organization, which maintains ties with industry and the Defense Department and often advises on industrial equipment and problems, had discussed the problem with the Navy and requested a study for submission to N. P. Canine, Assistant Navy Chief of Staff. In view of the Defense Department's action, the report, was sent to Robinson.

Former Action Urged

NSIA said it does not disagree with the objective, but feels that the present action "represents a drastic overreaction."

"Our study of the problem," it said, "has indicated that the principal reason for existing delays in pricing contracts to the government after final determination of prices is the government's inability to put through price-variation amendments."

"We believe that most of what the government desires could be achieved



F-102As at Palmdale

FOUR CORVAM F-102A jet interceptors fly up for takeoff on runway at Palmdale, Calif. Shown at speed comes from the hundreds of two stalls left on concrete by fast taxiing. F-102As are undergoing production flight tests at Palmdale.

AVIATION WEEK, October 17, 1955

advanced
technique



guided missile
instrumentation
by AVION



Submarine and/or bomber
of various magazines for
X-Band
C-Band
S-Band

Developed by AVION for the Signal Corps, these beacon detectors selective measures and pulse detectors to various interrogation capability.

Avion's flexibility and ingenuity, coupled with extensive experience in Electronics, Mechanics and Optics can better serve you.

Investigate the career
opportunities in our non-
profiting organization



AVION

INSTRUMENT CORP.

INCORPORATED, 101 C. F. STREET, NEW YORK, N.Y.

277 Highway No. 17, Paramus, N.Y.



Tail section of North American 747-100

vacuum-melted metals for "hotter" engines...

Vacuum-melted metals are breaking the "thermal-metal-barrier" of jet engine design. For they make possible higher engine operating temperatures, under conditions where conventional alloys fail rapidly.

Turbine blades of vacuum-melted superalloys, for example, were tested together with comparable blades of air-melted alloy. After 40 hours of operation the air-melted blades broke when bent less than 90°, the vacuum-melted blades took a full 180° bend without failure! For most shaft ball bearings, too, vacuum melted metals far outperform conventional alloys.

How's why... VACUUM MELTING LTD. REALLY SLUGS GASBORO IMPURITIES FROM THE MOLTEN METAL. REMOVES INCLUSIONS AND CASSES THAT LIMIT

THE PERFORMANCE OF CONVENTIONAL AIR-MELTED ALLOYS. RESULT: PURE METALS WITH EXCEPTIONAL PROPERTIES... LONGITUDINAL AND TRANSVERSE UNIFORMITY, HIGH STRENGTH AND STRESS RUPTURE STRENGTH, BETTER DUCTILITY AND FATIGUE STRENGTH.

Vacuum Metals Corporation, pioneer in the development and production of vacuum-melted and cast alloys, is producing these unique new metals designed for a wide variety of aircraft applications. If you have a metals problem that vacuum-melted alloys might solve, please describe it in as much detail as possible. Write Vacuum Metals Corporation, P. O. Box 977, Syracuse 1, New York.



VACUUM METALS CORPORATION

Jointly owned by Crucible Steel Company of America and National Research Corporation

Hawaii Airline Studies Fokker Turboprop

Trans Pacific Airlines, Hawaiian Islands operator, has announced that it is considering the purchase of two or three turboprop-powered Fokker F-27 Friendship transports as replacements for its DC-8s.

David A. Bena, TPA executive vice president and Otis V. Andrew, operations manager, recently returned from Europe where they studied current DC-3 replacements including the 40 passenger F-27 and the American Traveler Aircraft.

Bena said that, although no firm decision has been reached in the airline on purchasing either of the planes, he and Andrew will return to Europe sometime early next year to be on hand to watch the aerial fight trials of the Friendship transport.

The new transport plane is scheduled to be available to operators in 1971. TPA's target date for modernizing its current fleet.

Trans-Pacific plans to buy new planes with funds from the sale of its DC-8s.

Officials of Hawaiian Air Lines Inc., with headquarters in Las Vegas, also have announced their interest in the Fokker Friendship. Edmund Cassano, Hawaiian president, plans to inspect the Friendship and has said that the plane "may be the solution to the low-service airlines' problem."

Skymotive to Open New Service Terminal

A new business aircraft operation and maintenance terminal centered around a recently completed 123 ft. x 40 ft. portal structure hangar will be opened by Skymotive Inc. at O'Hare Field Chicago International Airport on Oct. 15.

Skymotive has obtained a 28-year lease on the area around the new space ten-times to more than double the size of its present facilities for possible expansion.

The terminal operator reports that it already has more than a dozen corporations leasing space in the facility, which includes a FAA-approved repair station, extensive Class I & II, no limitations, radio, Class I & II, no limitations.

The new airport will be opened officially for release on October 15th, when major current will transfer operations from Chicago's congested Midway Airport.

... Bush, Conklin, Greenhouse... Aviation Week Buyer's Guide, Nov. 28

AVIATION WEEK, October 17, 1968



design predictability

Trying to fire up new fuel pump specs? Well, stop staring at your slide-rule... call Hydro-Aire right now. The performance of our HY-V/L* Fuel Booster Pump is as predictable as stars at a picnic. We'll show you a sample chart marked that'll put the clouds out of that crystal ball.

Yes, the HY-V/L can be tailored to your specific needs. And that has already been done by such customers as Chance Vought, McDonnell, North American and Douglas.

HY-V/L* fuel booster pumps

a product of



BUREAU, CALIFORNIA • Aviation Subsidiary of CRANE CO.



More room in the sky

...through

TACAN

revolutionary **ITT** development

*...providing multiple airlines
instead of one!*

This remarkable system can virtually make the sky as much as "ten times wider."

Now parallel all-weather airlines can be marked off in the sky by electronic means...airlines that be side by side, only a few miles apart, yet never meet.

This can now be accomplished through a computer which derives its information from a single airborne "package" that measures the distance to a known ground station and determines bearing with pinpoint accuracy.

Thus, in heavily-traveled areas, multiple and accurate routes can be provided for aircraft to fly safely and efficiently, maintaining heavy traffic schedules in adverse weather.

TACAN is the result of a series of development programs sponsored by the U. S. Navy and the U. S. Air Force at Federal Telecommunications Laboratories, a division of IT&T, Federal Telephone and Radio Company, division of IT&T which now manufactures the military version of TACAN, will also manufacture and market the commercial aircraft and private fleet versions of the equipment.

IT&T



INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION
67 Broad Street, New York 4, N. Y.

crewmembers

breathe easy...

with **ALAR**
AUTOMATIC
OXYGEN
REGULATORS



They breathe freely and thus clearly... in planes equipped with Alar. Because regardless of the altitude, Alar Regulators automatically supply the oxygen needed to properly maintain muscular and mental responsiveness. Manufactured in a full range of models to meet every requirement... Alar regulating instruments are precision made to insure absolute dependability... and field proven by millions of hours under all types of flying conditions. So whether your design calls for oxygen regulators to serve a crew of one or a dozen... or a plane-load of passengers... they'll "breathe easy" when you specify Alar. Write for illustrated catalog today.



Specialists in
the design and development
of dependable pressure
regulating instruments



ALAR PRODUCTS • INC.

1071 POWER AVENUE • CLEVELAND 14, OHIO

CAB Proposes Pacific Mail Rate

Final service and rate for Pacific air routes of Pan American World Airways and Northwest Airlines have been proposed by the Civil Aeronautics Board.

The proposed rates are based on equalization of mail rates on competing route segments.

The Post Office Department will pay \$5.9 million on the new ending Mar. 31, 1955, compared with one per day under the old rate of 67 cents a ton-mile.

The new rates are calculated to yield an average of 42.74 cents a ton-mile for Pan American and 46.76 cents a ton-mile for Northwest on routes made mail operations. They are effective Apr. 1, 1955.

CAB set a rate of \$1.77 cents a ton-mile for Northwest and Pan American for all Pacific services during 1954. In the period Jan. 1, 1955 to Mar. 31, 1955 the two carriers would be paid 46.76 cents a ton-mile.

CAB is sticking to its decision to apply a standard package for trans-Pacific mail pay of 5.073 miles. This is the actual distance on Northwest's great circle route, and PAA objects strongly to the modification since it has to fly a route that is 1,600 miles longer.

The Board says it can find no sound economic reason for charging the Post Office Department a different rate for transportation of mail between Tokyo and the United States for different routes.

The Board points out that passengers pay the same fare whether they fly Pan American or Northwest, and the same principle applies to cargo.

The proposed rates have been determined through a rate technique CAB applies the ratio between Northwest and PAA mail costs and the cost of the Big Four domestic carriers.

Proposed Mail Rates

	Cents per mail ton mile
JAN. 1, 1954-DEC. 31, 1954	
Northwest (all Pacific services)	\$5.27
Pan American (all Pacific services)	\$5.27
JAN. 1, 1955-MAR. 31, 1955	
Northwest (all Pacific services)	46.76
Pan American (all Pacific services)	46.76
ON AND AFTER APR. 1, 1955	
Northwest	
Seattle-Anchorage	47.06
Seattle-Honolulu	52.65
Seattle-Tokyo	46.44*
All other Pacific services	46.44
Pan American	
Seattle-Honolulu	52.65
San Francisco-Honolulu	52.94
Los Angeles-Honolulu	52.77
San Francisco-Tokyo	46.44*
Seattle-Tokyo	46.44*
All other Pacific services	46.44

* To be applied to the shortest route distance of 3,573 miles.

American Airlines, Eastern Airlines, to the mail rate average valid for these routes.

The result is a service mail rate for the Pacific routes.

Since rates are equalized over competing segments, rates on non-competing segments have been adjusted to parallel an average yield for each carrier which reasonably approximates the level of recognized cost of each service.



Spain's 207 Azor

The third twin-engine aircraft model designed in Spain to reach the production stage: the all-metal 207 Azor is fitted with two 2,540 hp Bristol Hercules engines and can carry a maximum of 18 passengers over 1,815-mile routes.

CABIN AIR VALVES PASSENGER CONTROLLED

Models 20-A and 20-C



Adjusted 100 mil. Airs Controller

Model 20-B

Adjustable Air Valve

Cooperating Air Valve
Drilling 1/8" Hole in Aircraft
to Install Super Connector Port

WEMAC AIR VALVES provide a wide range of adjustable adjustments to control exhaust direction and rate of flow by control of nozzle. Air leakage and weight are held to a minimum (limited 100% to aircraft specifications). Made of metal and/or plastic. Fast-to-use for color-coded or control with cabin door.

- We Also Manufacture**
- EDGE LIGHTING PANEL LIGHTS
 - AIR CABIN LIGHT, REPAIRS & COUPLER REPAIRS
 - ELECTRICALLY HEATED EQUIPMENT

For Complete Details
Please Write

wemac
COMPANY

Designers and
Manufacturers

303 SOUTH 10TH AVENUE
MURKIN, CALIFORNIA

Representatives:

George F. Smith & Co., Inc.
1000 North Main Street
Wichita, Kansas

Edward H. Smith
George F. Smith & Co., Inc.
1000 North Main Street
Wichita, Kansas

Eaton ROLL-FORM Process

The Eaton ROLL-FORM Process, originated and developed by the Eaton Manufacturing Company, has produced outflows of jet blades by a simple rolling operation. The grain structure of the metal is rolled to conform to the blade contour, thereby producing a blade with superior fatigue strength characteristics. In addition, the ROLL-FORM Process produces blades with a minimum of forging and machining scrap. This means worth while economies in the costs, along with increased production.

EATON
ROLL-FORM

EATON AIRCRAFT DIVISION
MANUFACTURING COMPANY

G. M. GAMBINI & CO., INC., PASADENA 1, CALIFORNIA



Performance vs. Tradition:

Gnat Wages Uphill Battle for Acceptance

By David A. Anderson

Herbicide, England—The Folland Gnat has become England's most controversial airplane. Favored by some and feared by others, it is the logical answer to the problems of light-aircraft design. The Gnat has been plagued by a long list of problems: lack of official backing, by fast-changing requirements and by divergent agencies.

Its most ardent supporters are the men pilots who have flown it or the Gnat in its aerodynamic prototype. Its most detractors are those in the military line, the civil service and manufacturing companies.

But in balance, the one for the Gnat seems to be winning out. Here's why: Development batch of Gnats has been ordered by the Ministry of Supply for evaluation; the number has not been fixed but should comprise the 20 English Electric F3 interceptors ordered in a similar program.

• Negotiations with foreign countries, particularly India, have deflected interest by these countries in the Gnat. In recent weeks, Folland has been visited officially by missions from India, Pakistan, Thailand, Belgium, New Zealand, Germany, Japan and Switzerland. The Canadian Navy is interested in a Sea Gnat carrier modification, the U. S.

Navy has asked for bids on a special version of the airplane.

• Squadron Leader Tennant's demonstration of the Gnat finished London much earlier than you could see the show of the Gnat in 1954 (AW Sept. 20, 1954, p. 11). Tennant, chief pilot for Folland, made highest run at 500 knots or better close to Mach 0.9, low above the runway, finishing with a rock-

eting climb on his first run, and turn of 70° on his subsequent pass.

The sparkling display impressed aviation journalists—see London news paper carried on article praising the Gnat and headed in "What will rescue the airplane?"

• Reaction of pilots at the Aeroplane and Armament Experimental Establishment (present proving ground of RAF



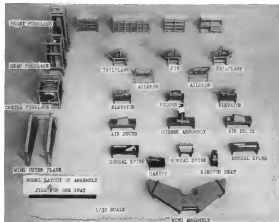
GNAT PERFORMANCE at Farnborough helped place overseas official testing.



POWERED BY GEMINI jet engine, Gnat has been handled by Folland as "the world's first successful light jet fighter." There is only one available right up to high-altitude performance limit.



POWER-OPERATED wheel-retracting doors when undercarriage legs are fully down and move in steps to stop approach speed.



LINEAR ACTUATORS

R-580

650 lb. max. op. load
with intermediate
position switch
wt. 2.0 lbs.



AVAILABLE FOR EITHER 26 V D.C.
OR 400 CYCLES A.C.

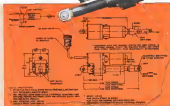


R-584

650 lb. max. op. load
wt. 2.0 lbs.



AVAILABLE FOR EITHER 26 V D.C.
OR 400 CYCLES A.C.



LINEATOR® • ROTORAC® • TRIM TROL® • ROTORETTER® • ANGELGEAR®

ROTORLOK

AIRBORNE

ACCESSORIES CORPORATION

BULFORD 5, NEW JERSEY

Represented in Canada by WYNNEFF ROTR LIMITED - 745 J.B. Plessent Rd., Toronto 16, Ont.

NEW AIRBORNE CATALOG

Contains full information on the Airborne line of electrohydraulic actuators and test systems. Write for your copy today.



equipment) was enthusiastic. AdAEE pilots, who have almost unanimously rated every previous British military airplane reported complete satisfaction with the Meteor. In particular, they singled out the longitudinal control system for praise, emphasizing its effectiveness in the maneuvering of the aircraft in the air.

Tangible Proof

The Goett is tangible proof of the light-lighter concept: its design philosophy—to do more often more, for less—flows from day to day in the product of W. E. W. Fetter.

Like the Goett, Fetter is a combination figure.

His design credit are the Westland Lyonard, Whirlwind and Wicken and the English Electric Canberra, he also contributed to the concept of the P1 before he left English Electric. He refused to be bound by tradition in design and has led his team publicly with one or more of the old-time British designs. They too are another for the Goett.

But Fetter's shadow is not to give an inch, plus he determined drive to get the light-lighter concept accepted. One pushed the tiny blue plane into being and into the spotlight of inspection.

Finally, the Goett has performance matching or bettering its engine power. Its speed is high, altitude, and a variety of other controllable right up to its performance limits. "You're the Goett," said one British test pilot, "It doesn't fly."

It can stay as close as you want to the line with external fuel and for two hours with internal tanks. Its wing is over 30,000 ft. and can be expected to improve as the engine and engine develop during the next few years.

Span of the tiny craft is 22 ft. 2 in., overall length is 23 ft. 9 in., wing



DOE VIEW shows Goett's low horizontal off-flying tail, high swept wing



MODEL designed by Folland shows Goett sub assembly. First one 1/10th scale size

sweep at 48 degrees. Gross weight is under 7,000 lb.

Powerplant of the Goett is the Bell X-1000 auxiliary turbojet, an engine with a three-stage turbo compressor. Now rated near the 4,000 lb thrust level, the X-1000 is expected to be improved to 4,500 lb to the end of the year.

Meanwhile, production of the first few Goetts is on schedule. The third

supersonic aircraft Goett-in is the propeller, complete. Production 100 and 1000 are being built on a small section of the Folland plant here. Sub-assemblies for Number Four and later airplanes should now be headed for completion assembly.

Design Improvements

Pre-flight production development is a program to keep the Goett design ahead of the changing aerodynamic tests. Aerodynamic and structural improvements are slated for incorporation in each model. Among the contemplated design changes for the Goett:

- **Slab tail** for aerodynamic efficiency above some speed. Current Goett slat-tail design—a modified all-flying tail—holds its effectiveness up to Mach 1 in flight. One example, Transonic, has pulled more than 0.9G at 25,000 ft. at an indicated Mach number of 0.95, with the slat force less than 50 lb. Fetter said that engineering has been completed for the slab tail design, but that he intends to hold off on the M-1 Goett because of the increased cost and maintenance associated with slab tail.
- **Thin wing** of 650 thickness-chord ratio replacing the present 85% surface. This thin wing has been designed and



DETAILS of the Goett 10 mm gun installation are revealed in other display.

From Wyandotte... answers to modification & maintenance problems



At Wyandotte's modern research center (above), performance-oriented products are developed and tested. Practically any design problem can be diagnosed and studied. In addition to huge plants in Wyandotte, Mich., Wyandotte's vast facilities for producing specialized changing products include a new plant in Los Nietos, California.

YOUR PROBLEM	ANSWER	DESCRIPTION
1. Sheet cleaning	Aldex®	Efficient formula removes all types of soil from aircraft skin, wings, engines.
2. Section cleaning	1-1584	Non-flammable, non-toxic, non-corrosive. Cleans all types of aircraft surfaces.
3. Cockpit cleaning	1-1079	Nonflammable, non-toxic, non-corrosive. Cleans all types of cockpit surfaces.
4. Integral fastener cleaning	2095	A "universal" cleanser for removing all types of coating, corrosion, non-flammable.
5. Removing exhaust stains	1-10	Removes exhaust stains from aircraft, ground, corrosion, and exhaust stains from aircraft.
6. Fuel metering	Ignason	Aluminum paint remover. Cleans all types of fuel metering.
7. Engine internal cleaning	2085	An all-purpose cleaner for removing all types of oil, and ground line, aircraft surfaces.
8. Working surface cleaning	2087	A special low foaming, non-toxic, non-corrosive, cleans all types of aircraft surfaces.
9. Aluminum brightening	Aldex®	Brightens for exterior aircraft surfaces. Cleans and brightens in a single operation.
10. Floor absorbent (anti slip)	Rebital	An all-purpose floor absorbent, water floor, disperses, sets off, and sets off.

See us for more.

MAIL COUPON TODAY FOR FULL DATA

Wyandotte CHEMICALS

AIRCRAFT DEPARTMENT 5921 • Wyandotte, Michigan

Please send FREE DATA on each problem whose number I have circled.

1 2 3 4 5 6 7 8 9 10

Name _____ Title _____

Firm _____

Street _____

City _____ State _____

built in Poland's experimental shop. Structural testing of the surface has been successful and it will be incorporated into production Glats at an early date.

• **Redesign of the upper back of the fuselage.** The dorsal spine of the Glats is enlarging because there are more things to put in it, and the rear fuselage may be expanded to accommodate an afterburner for the Bristol Olympus. Both these changes run into a reshaping of the rear contours of the fuselage to eliminate the indentations on the upper surface, either side of the spine.

• **Cockpit modifications in layout.** The throttle quadrant will be lowered a little for better visibility of the side shift, all side instruments are to be moved to match the pilot's line of sight.

• **Other aerodynamic changes of a minor nature**—such as wing and wing fences because of the slight tendency of the Glats to drop off on a wing at the stall. The duct inlet lip is being cut back now to find its effect on engine performance and anti-engine working. Pitter says the area distribution of the Glats is probably favorable enough so that the plane would not have to be redesigned to the new role.

Glats Aerodynamics

Aerodynamic design of the Glats is conventional by current standards. The wing is of low aspect ratio (5.5) and is swept 45 degrees.

The horizontal tail is set low on the fuselage to avoid push-up problems, its sweep is greater than that of the tail. Both wing and tail are of constant 6% thickness chordwise, but, as mentioned above, the wing will be changed to a 5% value as later production airplanes.

Two features help account for the maneuverability of the Glats—forward section and a variable can. The all-flying tail.

The forward section can power-operated, they drop to act as flaps during the landing approach. The design was used on the second wing fitted to the Mig-21 and proved completely satisfactory. The rate of roll around the nose, the landing approach with altitude dropped was slower and steeper and the landing run was reduced.

The Glats horizontal tail members power and manual operation. The tail is powered by a hydraulic for rudder deflection, and there is a secondary electric line under the rudder. Elevators are manually operated from the stick. Motion of the elevator moves a valve which allows the hydraulic system to operate the stabilizer as a follow-up. The pilot can switch the hydraulic power system on or off as he

ARO Vision-eering Leads IN OXYGEN EQUIPMENT



70 LITER CONTAINER



5 LITER EVAPORATOR

CLASSICAL TRANSDUCER

ARO TRANSDUCERS are the most accurate and reliable for measuring pressure, temperature, and flow. They are available in a wide range of sizes and materials to meet your specific requirements.



ARO Liquid Oxygen Containers save space and weight...

ARO's new line of liquid oxygen containers is the only one of its kind. It's the only one that's been tested to meet the most stringent requirements for liquid oxygen storage.

In the specialized sphere of oxygen equipment and components for high altitude flight... aviation looks to ARO for leadership!

ARO research and development have pioneered and perfected many of the new products to control the vital oxygen supply for the men who fly "very special." Leading aircraft makers depend on ARO for a growing number of precision products. For further details write:

THE ARO EQUIPMENT CORPORATION
2525 AMI CLEVELAND, OHIO
A subsidiary of The ARO Corporation, Inc.
A subsidiary of The ARO Corporation, Inc.
Office in All Foreign Countries

AIRCRAFT PRODUCTS

ARO's new line of aircraft products includes: Oxygen Systems, Fuel Systems, Hydraulic Systems, and many more. They are available in a wide range of sizes and materials to meet your specific requirements.

ARO



ONE OF THE THINGS THAT FLY

*One of the few things that fly . . .
that couldn't be made better
with 3M Adhesives, Coatings and Sealers*



For a free booklet describing 3M Adhesives, Coatings and Sealers at work in the aircraft industry today, write to 3M, Department 2410, 417 Plymouth Avenue, Detroit 2, Michigan. For more facts, call in your 3M Field Engineer.

ADHESIVES AND COATINGS DIVISION MINNESOTA MINING AND MANUFACTURING COMPANY

device. Tail deflection is from zero to mean 12 deg. inclination.

The motor is not powered but has tensioning springs.

The first reaction of an observer at the badge and Gnat in flight is apt to be "You don't maneuver like that!" To our T-28 pilot and right term of maneuver attitudes is an unalterable and starting experience. Seen from behind, the Gnat appears to quarter-roll up on a wingtip and then pull into a turn of tiny radius.

Handling the Gnat

Takeoff of the Gnat at Fairbrough was somewhat longer than expected part of this was due to the desired thrust of the Oxydizer, and part to the natural content of a pilot with the only prototype at a public display.

Rate of roll of the Gnat is extremely high, comparable to a delta's rate. If the power burst is not used, the observer waits up at high Mach numbers, it is expected Beta Tennant and L. M. Whittington, who is the other pilot, believe this could fight with the Gnat without power on the controls but they are both powerful built, and the job of flying without power might not be so easy for a smaller in lighter man.

The Gnat shows no tendency to pitch up or to die in during aerobically maneuvers, as the pilots, as is there any evidence of buffeting at high Mach numbers.

Still in gentle and occurs at about 104 knots the S-28 with the airplane down and at about 100 knots the S-28 in the down position. Approach speeds are around 115 to 120 knots. The Gnat shows some tendency to drop out of the still on the left wing, but at that time the attitude is so nose-high that Tennant feels there is no danger of stalling out on approach. Approach speeds are between 115 and 120 knots.

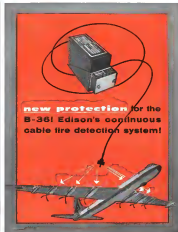
There is no speed restriction on lowering the fuselage, which are forward in the leading gear down and the gear down, lowered only partially. With the fuselage down, the Gnat demonstrates how top air speed to landing speed is about one minute.

At first glance, there might appear to be pilot objection to the track width of the leading gear, which is only 61 inches. Tennant said that other pilots had mentioned it before flight but not after making landings, indicating that there was no trouble.

Gnat Structure

Scaphere was Peter's guiding star in developing the Gnat. Its structure is a model of simplicity.

None of the airplane is a single large lumping that serves as the attachment point for wing, leading gear and fuselage. Instead of this is a low order of vertical



**new protection for the
B-36! Edison's continuous
cable fire detection system!**

The newest Edison fire detection system now provides positive protection for another of America's great aircraft—CONVAIR's B-36 long-range intruder-bomber.

Prompt fire detection is assured even if the sensing cable breaks, for each half will function as a closed circuit. And the entire Edison system operates directly from the aircraft's power supply without the need of electronic tubes.

Years of actual experience and constant research in the world-famous Edison Laboratory provide the secret fire detection system to keep you with the advantages of modern flight.

Other outstanding features

- exclusive snap design simplifies installation and speed maintenance—no tools needed
- maximum sensitivity for each cable because a single detected circuit can provide varying temperature alarm signals
- new impedance design completely eliminates false alarm-detection reactions or responsive effects
- minimum weight construction—the control assembly weighs only 4 lbs., 100 ft. of sensing cable only 1 lb.

Write us today for particulars on this great new Edison development!

Thomas Edison

A GREAT FAME CONSUMES GREAT NEW ACHIEVEMENTS

Thomas A. Edison

INCORPORATED

(INTERNATIONAL DIVISION) • 40 PARKER AVENUE • WEST CLARE, NEW JERSEY



TARGET...OIL

The target of the torpedo-like device hanging from this plane is not the land you see ahead, but the oil that you hide beneath it.

Secondarily the station, this sensitive instrument, known to petroleum men as a magnetometer, records the earth's magnetic field, indicating which lead is most favorable for the presence of oil.

It is a kind illustration of the interdependence of the petroleum and aviation industries. For petroleum supplies the power of aviation, an aviation supplies the means to search for this power.

Cities Service has long shared aviation for this important work. Likewise numerous airlines and airports have long utilized Cities Service products for their work. And just as these airlines and airports strive to provide the finest planes and service, Cities Service continues to provide the finest petroleum products to service these planes.

That's why you can always be sure of the highest quality aviation oils and products wherever the familiar Cities Service aviation emblem is displayed. Look for it.

CITIES SERVICE  **AVIATION PRODUCTS**
New York • Chicago • In the South: Arkansas Fuel Oil Corp.

their webs and horizontal beams, run along the inclined bolthead pins to hold the pilot. From these forward, the structure is conventional: wing and stringer and is the conventional portion of the plane.

To this basic box with a nose are bolted the sheet webs and during the dorsal spine and the ventral sections. Thus, the box is the main fuselage ribs that must be built as an expensive rig the ducting and upper and lower set moves can be bolted back in simple form.

Six tapered bearing pins define the wing position, and four bolts are the connection between wing and fuselage. One of the most unusual test rigs in the aircraft business has been developed at Ford for measuring stresses in the engine when the 10-man Adco revolver engine are fired. It consists of a strongback, frame, much like an structural test rig, in which a limited fuselage portion section of the Gnat is spring suspended. Springing has a low frequency and simulates the ground stresses of the engine in flight.

More than 600 stress pins have been fixed to the fuselage section to measure the stresses. 300 of these are connected for the local loads produced by the firing. The reason for the rig is that the Adco has no direct bench measurements, and firing the pins produce a torsional load from the recoil on the gun mount.

Powerplant

Ford engines give each credit for the success of the Gnat to its powerplant, the Bristol Ophion. The light weight turbojet had never been flown before its installation in the Gnat prototype, and then was quite naturally noticeable, apprehension about its airborne performance.

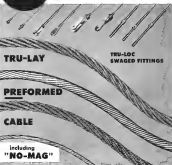
Many hours of ground tests had passed the engine, the big question was what it would do in the air.

Before the first flight, 10,000 ft had passed the Gnat all over California (all of it) at all speeds and attitudes to test it. Almost that the engine worked and didn't stall out at angles of yaw or attack. First proof came on the first flight, and the Ophion has given no trouble during the test program.

The long-knifed Viper used to power the MiG prototype also proved its worth during the tests, than 170 hours rolled up by that plane before it was last downed, killed in Swiss pilot Max Mathis. Originally cleared for only 25 hr flight time, the Armstrong Industries engine was cleared further for 90 hr before the 25 hr period had elapsed. The engine was changed at the 56 hr mark and replaced with a new engine. The older engine was removed and its shaft in the MiG at the 100 hr flight time test.

One thing must be understood about

ACCO products TRU-LAY Cables TRU-LOC Fittings



Solving Aircraft Design Problems...

is an old story to ACCO. The originators of preformed cable and swaged cable for aircraft use, ACCO engineers have now introduced new non-magnetic aircraft cables. The complete line of ACCO cables and fittings now includes:

New "No-Mag" Cable — ends instrument interference New "No-Mag" Aircraft Cables are made from Type 302 stainless steel. Their advantages include:

- Resists non-magnetic areas after many cold working — eliminates instrument interference through cable magnetism.
- Resists corrosive treatment; proper heat treatment stainless steel.
- Thermal expansion characteristics are much closer than standard cable to compensation of aluminum alloys used in aircraft — the resulting strain is less likely to cause under stressing temperatures.
- High fatigue and vibration resistance.

Preferred construction.

TRU-LAY Cable Provided in all standard sizes and carbon steel is a complete range of sizes and constructions. Because it is preformed it:

- Can be cut without strutting.
- Is never too flexible — less tendency to loop or kink.
- Can be installed in less time.
- Is free of tendency to rotate — runs true over sheaves or pulleys — is easier on pulleys.
- Has greatest resistance to bending fatigue — gives longer service.

TRU-LOC Swaged Fittings

• Guaranteed to hold to the rated breaking strength of the cable with which used.

- Eliminate costly, uncertain splicing.
- "Quickset" — specially developed double-shank bolt type swaged-on cable is possible to construct and disassemble without special tools.

ACCO



Write: Detroit office for specifications
**Automotive and Aircraft Division
AMERICAN CHAIN & CABLE**

881 Stephenson Building, Detroit 2
2314 S. Garfield Ave., Los Angeles 21 • Allendale 1, Conn.

**Aircraft
Cable
+
Swaged
Fittings**

pre-cise (pré-sis), *exactly or sharply defined or stated, not vague, accurately made, reliable, not varying in the slightest degree from accuracy, standard, etc.*

A fitting description of Ideal Aeromath test equipment. High engineering standards and rigid quality control production methods assure the reliability and precise execution required by the industry today.

IDEAL PRECISION BAROMETER-CONTROLLERS PROVIDE AN ACCURATE METHOD OF CALIBRATION. Providing a range from 0" to 100" Hg, Ideal barometer-controllers can be used for precision calibration of such equipment as altimeters at different pressure settings (potentiometers), air data computer transmitters, flow balance system components, altitude controllers and switches, altitude transmitters, standard pressure activated aircraft instruments, such as sensitive altimeters, and in special applications, sensitive to true speed indicators and instrumentation, manometer indicators, manometer transmitters.



Barometer Controller Model 11-110-01



Barometer Controller Model 11-110-02



Barometer Controller Model 11-110-03

IDEAL
sets new standards

for precision
pressure control

IDEAL PRECISION TEST CHAMBERS FOR A WIDE RANGE OF APPLICATIONS. Ideal instruments test chambers are equally suited for use in the development laboratory, production calibration or final test of the wide range of pressure-actuated instrument mechanisms used in the latest aircraft and missile systems. It is not unusual to use Ideal instrument test chambers being used in the aerospace inspection departments of electronic system leader plants to check many pressure-actuated potentiometers and related components more rapidly and dependably than ever before possible.



Test Chamber Model 11-110-04

IDEAL PRECISION RATE OF MOTION EQUIPMENT MEETS A NEW REQUIREMENT IN ACCURACY. In the development and maintenance of rate-of-motion equipment for aircraft and other types of industry, Ideal takes pride in its unusual facilities which permit the production of an extensive line of equipment of great rate of motion in potentiometer systems. In addition to production of the many standard designs, Ideal is also prepared to meet the many unusual demands for special rate-of-motion equipment. Here again, Ideal equipment meets the utmost in accuracy and reliability.



Rate of Motion Equipment Model 11-110-05



Our new pressure instrument facilities are now available...write or wire for your copy today.

IDEAL-AEROSMITH, INC.

12602 South Davis Avenue, Hawthorne, California

the Gush is a complete airplane, just as the Douglas A4D, pioneering the lightweight concept in this country. Instrumentation is standard, as are the equipment and controls. Cockpit layout is easy enough to take. Versatile in an unlimited pressure unit, and that should provide room enough for most pilots.

Equipment includes a complete altimeter and lightweight oxygen unit, a gyro compass, oxygen regulator, VHF radio and standby air, DME, radio range or IFF gear, a lighting chute and provision for a landing device. Cockpit temperature is regulated. In the pilot, a single selector valve gives him cold, warm or hot air in intermediate positions.

The Gush is tiny, and most of the maintenance work in the case of the airplane can be done at seat height. When you stand alongside the airplane to talk with the pilot seated in the cockpit, his ears and yours are about at the same level.

But for its size, it can pack a formidable wallop. It has twin 10-horse engines and can carry—for a short-range

ground support—more—in such as 2,000 lb. at critical stages, or roughly one-third of its normal gross. It can be adapted for carrier use as a development wing-folding. More than 35% extra complement of Gush could be carried.

That the Gush shows promise and proven performance. Its production design has been carefully planned for minimum cost and maximum ease of maintenance. Pilots tell us how, with its performance, and turbulence proof its concept and detailed engineering.

First Gushs can be bought for the price of two F4Es, if some of the current figures of fighter cost are correct. In production, a Gush would sell for between \$10,000 and \$175,000, ready to go.

Folland, with the highest aerospace weight saving per man in the British aircraft industry, has established itself as a firm able to produce deliveries on a wide variety of subcontracted items. The spirit is available to build the Gush.

All Folland needs is the word to go ahead.



Tow Reel Handles Giant Banner Target

High-velocity tow and retrieval of giant banner target on a two-mile cable at speeds of more than 600 yds. has been developed by USAF by Northrop Aircraft, Inc. The reel accommodates 16,000 ft. of cable and can pull a target towing over 400 sq. ft. in area, with E, H and F-4 in tow. First work off the production line will be completed in March E-57 and North American B-47. Towable jet bombers with retractable landing gear, several built can be placed in such target-carrying airplane to provide a multiple-target capability.

AEROTHERM

AIRCRAFT SEATS



Reduce

Maintenance with Interchangeable Parts

Uniformity of parts simplifies inventory and cuts maintenance costs.

Production tooling, stocked for future needs, assures interchangeability of replaceable parts for any Aerotherm seat.

Inventory reduction equals reduction of investment. Why not contact our Project Engineers on your seating problems?

AEROTHERM
THE THERMEX CORPORATION
THERMEX CORPORATION, 6000 South Davis Ave., Hawthorne, Calif. 90230
South at 101st St., P.O. Box 101, Los Angeles 47, Calif.
(213) 940-1000
THE AEROTHERM CORPORATION
BANTAM 1000

NEW

radically new
all metal
vibration mount

withstands repeated
15-G
shock loading
(meets all requirements
of MIL-C-173-5)

yet weighs less than
conventional mounts

Resonant frequency less
than 10 cps., magnification
factor less than 1.5
at resonance, with no
drift in parts "QPL" of
noise.

FINN

Patents in flightweight shock
and vibration controls

T. B. FINN & CO., Inc.
200 Central Avenue
Hewlett, New Jersey

Send for complete literature

Rolls-Royce's Pearson Reviews Jet Engine Development Problems

Designers of British civil aircraft who want to use turbojet engines in the next five years should have plenty to choose from. But they may have to take the plunge to the available power plants.

If they choose turboprops, they will more likely find engines designed for their particular type and size of aircraft.

The reason, says J. D. Pearson, managing director of Rolls-Royce's Aero Engine Div., is that the impetus for turboprops in Britain has been mainly civil, with the military more interested in turbjets. Delighting the late Albert Pearson Memorial Lecture at Delft, Holland, Pearson said his company's Dart was the first aircraft engine to go into large-scale production for military use without substantial prior military experience. Now, it is likely that the Dart will be the last turboprop powerplant that will have to follow this pattern.

Teething Troubles

This is unfortunate for the airline operators," Pearson says, "as it seems that they, and not the military, will have to go through the teething troubles of an entirely new engine." It would help if the military took the first pro-

duction engines of a new series for use in a narrow transport or one the civil-developed engines for their own transport uses, Pearson says. Since designers cannot rely on this happening, they must assume that turboprop development will continue to be a job for civil aviation for some time.

Pearson did not mention U. S. turboprop development, but undoubtedly was thinking of Military Air Transport Service's turboprop program, which includes the Allison T36 and the Pratt & Whitney T34. The T36 as its civilian version—Model 581—has been ordered to power American Airlines Lockheed Electras.

Development of the Rolls-Royce Dart, from the time the design was laid down in 1945 to a 1,200-hp engine for a single-engine military transport, until delivery of the first production Dart 505 took about 12,000 hours on the bench. There were delays because this was the first turboprop engine to be taken through its production test program. They can expect new civil engines will not take much less time.

"Any credit for getting clever and handling from past experience and the knowledge which has been accumulated is balanced by the fact that each

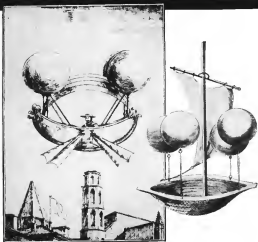


Dimpled Shroud for F-102A

Dimpled end edges rolled into titanium sheet at the forming mill will give greater rigidity and strength to the dimpled end on the J57 turbojet engine that powers Convair's F-102A. The new technique also permits use of thinner titanium sheet. This, together with the replacement of rivets by welds and cast welds, cuts the dimpled weight. Convair's Design says the F-102A is the first airplane in which the dimpled technique will be used.

MAN'S CONQUEST OF THE AIR

Lana's Flying Boat



Of the many ways by which man has tried to fly, here is one of the strangest. It involved pumping all the air out of four copper globes attached to a boat-like car. This weird chariot was designed by Francesco Lana in Italy about 1670.

What Lana didn't know was the actual pressure and density of air, so he might have seen his error. Both of these were determined two years later. Even so, the idea still served as a stimulus nearly 300 years afterwards. In fact, a Frenchman,

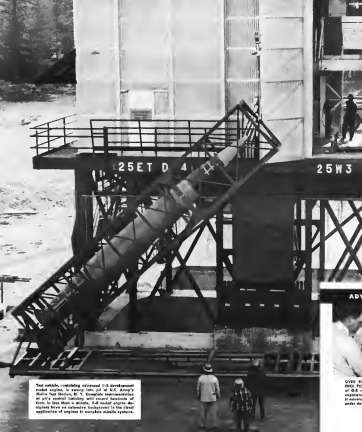
Missey Monge, actually built a machine from Lana's plans and tried vainly to fly it in 1843.

We may smile at Lana's flying boat now, but it was one of our first and one that man finally flew. Today 1880 research, which has played an important part in the development of supersonic aviation, periodically looks over the work of powered flight, is continuing to seek new and better ways to help man fly.

Another reason why most
operators specify



INTERNATIONAL AVIATION PETROLEUM SERVICE



ROCKET ENGINE PROGRESS AT GENERAL ELECTRIC

Weight Cut More Than 50% In NEW G-E Rocket Thrust Chamber

General Electric has tested an advanced rocket thrust chamber which weighs 35% less per pound of thrust than previous chambers of similar design. This marks another step in General Electric's continuing progress in developing better engines for the aviation industry. The significant weight reduction was achieved without compromising performance and reliability characteristics typical of G-E engines.

General Electric has been cutting rocket engine weight ever since G-E engines ran the first U.S. tests on German V-2 engines in 1947. For example, the use of lighter materials and the transfer of start-up components from mobile to ground are two weight reduction methods G-E has pioneered. Experiments with new materials and new areas of fabrication promise even more improvements on future engines.

Advanced Facilities Speed New Rocket Engine Development

Today, General Electric is able to undertake a wide variety of rocket engine development work. The Company's rocket tries, as an integral part of the Aircraft Gas Turbine Development Department, has access to the nation's most advanced privately-owned aircraft engine development facilities, as well as support from other G-E labs.

These facilities spell more and faster development progress for rocket engine programs and they underline G-E's increased capability for developing a wide range of rocket systems, subassemblies and components. To find out how General Electric can meet your specific rocket engine needs, contact a G-E Aviation Specialist through your nearest G-E Apparatus Sales Office.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ADVANCED ROCKET ENGINE DEVELOPMENT ACTIVITIES AT G.E.



OVER EIGHT YEARS' EXPERIENCE FOR R&D is the record of G-E rocket engineers. This experience is now paying off in advanced preprototype designs under development.



STRONGER, LIGHTER WEIGHTS being developed at G-E will give rocket engines greater reliability, higher performance. A technique at the Company's Materials Laboratory checks a new alloy for tensile strength.



PREDICTING ADVANCED WE ENGINE PERFORMANCE with electron computer calculations, enables G-E engineers to describe written design characteristics of engines still on the drawing board.

G-E Facilities Available to Support Rocket Engine Programs:

- Component Development Laboratory
- Materials Laboratory
- Research Laboratory
- General Engineering Laboratory
- Combustion Laboratory
- Metals and Ceramics Laboratory

Test vehicle, containing advanced G-E development rocket engine, is being taken out at G.E. Army's Ballistic Test Station, Ft. T. Connelley, Massachusetts. At left's control building will record thousands of tests in less than a minute. G-E rocket engine development here is extensive background in the direct application of engines to complete vehicle systems.



GOING 8-47, 6-JET BONNER, at the Georgia Division, Lockheed Aircraft Corp., Marietta, Georgia, serviced by G-E Frequency Changer Package that supplies ground power for testing of electrical control and equipment for radio, radar, and electronics systems.

LOCKHEED AIRCRAFT CORPORATION REPORTS . . .

"G-E GROUND POWER UNITS GIVE US COMPLETE DEPENDABILITY"

43 G-E FREQUENCY CHANGERS NOW IN USE AT MARIETTA, GEORGIA PLANT

Four years ago, Lockheed's Georgia Division purchased their first G-E frequency changer. They were looking for a portable ground power unit to furnish 400-cycle current with close voltage regulation and complete reliability. Results were so satisfactory with this first unit that they immediately placed an order for 39 additional units. Since then, General Electric has delivered 33 more Frequency Changers to Lockheed, bringing the total in use at Marietta to 43. They are used in the laboratory developing and testing new devices, on the factory floor where manufacturing, assembly, and modifications are in progress, and on the flight line for checking instruments and electronic equipment.

V. O. CAMPBELL, ELECTRONIC STAFF SPECIALIST AT LOCKHEED says, "We have found in G-E Frequency Changers the high degree of accuracy and complete reliability necessary in the assembly and testing of the B-47s which we are building for the Strategic Air Command of the U.S. Air Force."

PIONEERS IN DEVELOPING AND MANUFACTURING aviation equipment and ground power supplies, General Electric is prepared to help solve your problems. G-E Aviation Specialists are ready to assist you by specifying standard units which will serve your needs, or engineering proper equipment for specific conditions. For further information, contact your nearest G-E Apparatus Sales Office, or write: General Electric Co., Section 814-A, Schenectady 5, New York.

GENERAL  ELECTRIC

seconding engine gets more rough takeoff and more difficult. Power points out. As an example: The Dart has 12,000 parts, the new B-3 HRF has 20,000 parts.

Indicators of the progress in turbo-prop development, the B-3 HRF gives nearly three times the horsepower at the first service Ditch, without increasing overall dimensions and with only 50% greater weight.

Flight Endurance Tests

Flight endurance testing is a major problem with an engine which has no prior military background. The Dart accumulated 14,900 hr before the first Vermont transport went into regular passenger service. Most 9,000 hr was done on the two Viscount prototype.

Two BEA Dalcotas, fitted with Darts, operated 4,000 hr in freighter. Permen made endurance flying by an engine against the most volatile kinds of testing.

Increasing speeds and high altitudes present engine designers with new problems. Flight testing is restricted by weather conditions, lack of suitable airports at the stage of the development program when the test can stand, isolated, restricted run, that can be taken with a flight engine, and the difficulty of making sufficient quantities for test observations in flight.

The alternative is a ground test facility capable of simulating the desired conditions for a complete engine. Bell is building one with its own funds. The new facility will have a wind tunnel capable of testing models to Mach 4 and be able to handle full-scale engine tests at high and low pressure, and full-scale compressor test.

Performance Improvement

The turbo-prop engine finds itself very well in contrast, performance development, Permen points out. Improvements in turbine and compressor efficiency show up in increased horsepower—this difference because the power developed by the turbines and the power required to drive the compressor. For example in an engine like the Dart, if the turbine develops 4,500 hp, and the compressor takes 1,000 hp, shaft horsepower is the difference or 3,500 hp. A 1% improvement in turbine efficiency means turbine horsepower to 4,545 hp, equal to a 3% increase at the shaft, where horsepower is equal to 3,545 hp. Similarly, a 1% increase in compressor efficiency shows up as a 3% increase in shaft horsepower.

Another way of measuring the power and reducing specific fuel consumption of turbo-prop engines is by using the cycle temperature. Intensive develop-

ment work, proceeding on an cooled jet base blades and on cooled nozzle guide vanes will lead to continuous performance improvement of cooling turbo-prop engines for some time to come, according to Permen.

In turbo-prop engine increase in temperature has no such effect on performance. The thermodynamic efficiency of the cycle increases with temperature is more than offset by the decreasing propulsive efficiency of the jet, Permen points out. The optimum specific fuel consumption is obtained at a much lower flame temperature at subsonic burned gases than that at which the engine must be designed for good thrust/weight ratio.

However, improving the efficiency of components or raising the compression ratio by adding stages to the front or rear of the compressor will improve the specific fuel consumption of the jet engine. In one engine specific fuel consumption has been reduced 8% through these methods, according to Permen.

The bypass engine, described as a "hold way house" between the turbo-prop and the turbo-jet, can take advantage of higher temperatures, condensing the better efficiency obtained at a higher turbine inlet temperature with the improved propulsive efficiency demand.

Cole Electric Co.

2015 STELLER DRIVE • ROLTER CITY, CALIFORNIA • TEL 845-4131



Rotary Actuated Unit
Break
Normally Closed
Double Pole-Double Throw
Double Break
30 Wires D.C. 5 Amperes

DESIGNING, ENGINEERING AND PRODUCTION FOR THE AIRCRAFT INDUSTRY

- | | | |
|--------------------|-------------------|----------------------------|
| • Switches | • Transformers | • Oil Co. (oil) in service |
| • Motors | • Rectifiers | • Switchgear |
| • Motor-Generators | • Motor-Generator | • Transformer |
| • Frequency Relays | • Motor-Generator | • Switchgear |
| • Power Relays | • Motor-Generator | • Transformer |

... and many other products. Specialists in electronic testing. Write us regarding your requirements.

EVER LAND A JET ON A FLATTOP?

U.S. NAVY'S TOUGHEST PILOT:
TRAINING PROBLEM MADE EASIER
BY WORLD'S SAFEST JET TRAINER

LOCKHEED T2V-1

Once you try it, you know there's nothing riskier than sitting down on a carrier at jet landing speed. Add 50 knots to a yellowing, yawing, rolling deck, and death's plenty to think about, especially during early training.

That's why the Navy needs the world's safest two-place jet trainer. It's new in production at Lockheed.

The T2V-1 is the slimmest-loading, high-performance jet ever built—lands at less than 90 knots yet flies at close to 540 knots. It's the first U.S. plane ordered into production without Boundary Layer Control.

With "BLC," compressed air from the engine is sucked into the wing, then forced through lip holes over wing flaps. This causes air flow to lag flap surfaces, thereby increasing lift for safe landings at lower speed, shorter takeoff runs.

Other advantages of America's first carrier-based jet trainer: aerodynamically selected slots on the wing's leading edge for hyper-low-speed stability; selected rain suits for faster egress; a simplified and roomier cockpit; high-capacity landing gear.

The Navy T2V-1 is a result of Lockheed's unmatched experience in building over 4,000 jet trainers—starting with the T-33, the world's first operational jet trainer.

LOCKHEED

AIRCRAFT CORPORATION
BURBANK, CALIFORNIA

LOOK TO LOCKHEED FOR
JET LEADERSHIP TOO





OFFSHORE HELICOPTERS—Humble Oil Company's drilling projects in the Gulf of Mexico are being served by these new Sikorsky Aircraft HO4S helicopters. For over-water operations, the helicopters are equipped with special

features gear. Dependable Sikorsky HO4S, which avoid the hazards of surface transportation, have proved to be highly successful carrying drilling crews, special personnel and equipment between the mainland and offshore rigs.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS



SONAR DUNKER—Versatility of Sikorsky helicopters is again being demonstrated in the Atlantic, where Navy HO4S helicopters now perform anti-submarine missions. By dunking or towing special sonar gear, the HO4S is prepared to make a major contribution in the job of finding and killing enemy submarines. The HO4S, with rotor blades folded, is pictured aboard the USS Leyte.



COPTERS FOR CANADA—Sikorsky HO4S helicopters are now serving with the Royal Canadian Navy. The first shipment of an additional order of ten is pictured here during brief delivery ceremonies. Sikorsky helicopters, both military and commercial, are widely used in Canada. The dependable transport that they provide in a wide variety of jobs is especially important in Canada's wilderness areas.



HELICOPTER HISTORY:



FIRST ARMY FLIGHT OF THE VS-300

In July, 1940, the first Army pilot flew a Sikorsky helicopter. He was Capt. B. F. Gregory (now Brig. General), pictured here in the experimental VS-300.

This historic aircraft, America's first truly successful helicopter, led to the development of Sikorsky H-4s, with which the Army Air Corps pioneered helicopter operations during World War II.

H-34s AT WORK—New Sikorsky H-34 transport helicopters are now on the job at Army aviation centers. Here a group of 12 combat-equipped soldiers at Camp Rockwell, Alabama, stands with one of the big helicopters, which are larger and even more powerful than the widely used Sikorsky H-19s. The new helicopters are also built as the Navy's anti-submarine HO4S and will also be available as a 12-passenger commercial HO4C.



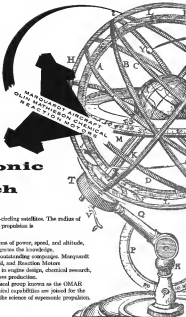
SIKORSKY AIRCRAFT

BRIDGE PLANT, CONNORVILLE
One of the Divisions of United Aircraft Corporation

new orbit for supersonic research

Aircraft... missiles... now earth-orbiting satellites. The radius of research in the field of supersonic propulsion is constantly being lengthened.

Speeding an attack on problems of power, speed, and altitude, a unique new research group integrates the knowledge, experience, and facilities of three outstanding companies, Marquardt Aircraft, Olin Mathieson Chemical, and Reaction Motors, bringing together leading authorities in engine design, chemical research, metallurgy, chemical and explosives production. Now coordinated through a technical group known as the OMAR Committee, chemical and mechanical capabilities are joined for the first time to add new impetus to the science of supersonic propulsion.



200



Marquardt Aircraft Company



Olin Mathieson Chemical Corporation



Reaction Motors, Inc.



Marquardt Aircraft
Olin Mathieson Chemical
Reaction Motors

500° F AMBIENT SOLENOID

Ideal for
high speed
aircraft
and missiles

This solenoid is designed to operate over a temperature range of -50° F. to as high as a scorching 500° F., and over voltage range of 18 to 36 volts d.c. Has a continuous life of 500 hours at 500° F., longer at lower temperatures.

Special impregnation makes it extremely resistant to the heat stresses which occur between pure resistance to other high-temperature units of this type. This impregnation also makes the coil impervious to salt spray and fungus. Change data available.

Size: 1.5 in. dia.
Coil: 1.5 in. dia.
Resistance: 14.5 ohms @ -50° F.
11 ohms @ -20° F.
10 ohms @ -100° F.
Force: 7 pound inches
Weight: 0.7 pound
Operating Voltage: 18 to 36 d.c.

Other J&H high-temperature solenoids include a d.c. type having an 1/8 in. dia. stroke and 1/2 pound force... a 1/2 in. dia. stroke with a 100 psi stroke and 3 pound force. Others can be customized to meet your specific requirements.

Write Jack & Heintz, Inc., 17065 Broadway, Cleveland 1, Ohio. Export Dept., 13 E. 46th St., New York 17, N.Y.

© 1953 by Jack & Heintz, Inc.

JACK & HEINTZ
Rohmco
AIRCRAFT
EQUIPMENT

willow chips is translated into a pulse and sent to a control section which it triggers a solenoid to operate the socket release mechanism.

ECA said that in no case one of the tests did the socket exhaust cause damage to either the rodent package or the simulated aircraft structure.

The system can be installed anywhere it can operate at any place for maximum effectiveness.

Willow Run Gets Long-Life Pavement

A welded wire network embedded in asphalt is designed to increase the life of ramps and taxiways being re-surfaced at Detroit's Willow Run Airport and cut down maintenance requirements. What is believed to be the first use of the "Willow Run asphalt" process for major resurfacing of an airport.

The resurfacing was undertaken in order to improve and extend the life of the original pavement in some areas and increase its stability in very close lands of up to 75,000 lb., single wheel. Welded wire fabric reinforcement of the 12-in. thick bituminous concrete was specified to reduce "reflective" cracking of the new surface over some what both cracked conventional portland cement concrete slabs.

The original airport pavement built early during World War II is 6 to 8 in. thick but was not reinforced due to steel shortages. In certain cases (1953) it slabs were acquiring ridges over reinforcement of joints and cracks. The new resurfacing is expected to reduce maintenance cost by 75%.

Approximate cost of the project was \$100,000, with Civil Aeronautics Administration paying up \$60,000 to match the total of \$40,000 each put up by Michigan State Department of Aeronautics and the University of Michigan. The university is owner of the facilities, having purchased it from Defense Plants Corp. after the war. The entire project, covering approximately 70,000 sq. yd. of pavement, required nearly 90 tons of welded wire fabric and about 14,000 tons of bituminous concrete, and was completed in 21 working days.

Turboprop Test Flights

Two Convair YC-119C turboprop transports have flown a total of 46 hr. 19 min. during a 24 hr. period. At large was divided evenly between both plants. Aircraft, belonging to 1706th Air Transport Group, MATS, Keesler AFB, Miss., are fitted with Allison 180 turboprop engines and Armstrong-Whitworth YC-119C made four flights during the period.

NEW TYPE OVERVOLTAGE RELAY

Unaffected
by environment...
needs no rectifier

Deep adjustment to desired voltage levels, long life, reliability and simplicity are other features incorporated in this J&H overvoltage relay for aircraft. While designed primarily for 480V a-c control panels, it works equally well on any a-c system at control panel.

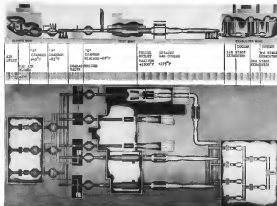
This "high switch" relay offers the following improvements over present overvoltage relay circuitry:

- Quietest switch, effected by magnetic means, unaffected by vibrations, in any direction.
- Smoothly riding contacts designed to handle inrush, surge, and stall energy.
- Arc power is almost always taken over on contacts.
- Low stand-by power drain.
- Adjusted to eliminate fly-back and line shunts.
- Simple and light over all work.

For complete details, write Jack & Heintz, Inc., 17065 Broadway, Cleveland 1, Ohio. Export Dept., 13 E. 46th St., New York 17, N.Y.

© 1953 by Jack & Heintz, Inc.

JACK & HEINTZ
Rohmco
AIRCRAFT
EQUIPMENT



PLAN AND EISE DRAWING of the Man's 540m² live area includes test laboratory shows layout of buildings and equipment.

Navy Opening Giant Engine-Test Facility

By George L. Chabers

West Station, N. J.—U. S. Navy officials this week are making final preparations for the official opening on Nov. 4 of the new Navy Acoustics Test Facility. The facility will be the world's most complete and powerful facility built specifically for designing and testing experimental and prototype torpedoes, submarines, sonar and pulsed power plants.

The 540-million Nixx stations immediately altitudes from sea level to 65,000 ft., air speeds from near sonic to sea level to supersonic at altitude and temperatures from -67 to 1300° . In the near future, the high-temperature variety will be pushed to 2200° .

Provisions for allowing close-by residents to sue for noise and related matters and sound attenuation equipment cost more than \$1 million.

Three Big Jobs

The 65-acre station is designed to conduct three types of testing:

- Steady state tests, which will give:

print most of the work. This includes
urgent qualification and collection test

- Transient tests, which will determine engine characteristics during acceleration and deceleration

- **Environmental tests**, which will check engine performance under various active climatic, temperature and altitude conditions.

The gas turbine engine research and test facility must always be a good jump ahead of industry, so there will be no delay in investigating new power plant developments, Capt. J. E. Dowling, commanding officer of NATS, pointed out to Aerospace Week.

As an example, one of the five trochils recently banded is the only one known to Nave that is capable of subjecting complete tailfeather regions to wide extremes of altitude and temperature. It contains an inlet three to six centimeters wide, which can be

Under some study is an "attitudinal coil" designed to help solve some

control, lubrication and bearing problems associated with powerplants for VTOL aircraft. The structure would accommodate a complete tailpost or tailboom powerplant in any position from horizontal through vertical.

1 Million Clas.
To qualify you are credited with

By jet engine, massive machines were large amounts of air-total compressed capacity is 1 million cfm—through the facility's two buildings, the slowest test and exhaust ways. The structures were erected in a straight line to minimize air flow pressure losses. Total air flow, according to 2002, is

Air is drawn into the compressor wing and rammed through 45-in. blades to 23 1/2-in. intercoolers. Here it is warmed or cooled to simulate heat or cold temperatures, then sent to the turbo-

As it is then blasted to the test cells. After passing through the gas turbine engine which is under test, temperature (of effluents) is read) was read 3,900°. This is quickly dropped to 175° by special nozzles to avoid heat damage to equipment in the exhaust wing. These three stages of blowers took us away from test cells to simulate high altitude conditions.

Large capacity refrigeration equipment and a separate heater system make it possible to cold-soak powerplants to -67°F to test cold starting in Arctic operating conditions.

Power consumption of the station will begin at 40,000 kw, soon increase to 50,000 kw and eventually jump to 100,000 kw.

With all the machinery in operation the test facility has a connected work rate load of almost 300,000 hp.

Control Center

Heart of the test station is a repetitive control racer built on the front of the test seat.

Here, a 35-ft. central control panel equipped with lights, dials, gauges and controls allow engineers to supervise the functioning of every part of the laboratory, give permission to operate unattended, and direct air flow.

Controls were diagnosed and certified by Minneapolis-Honeywell Regulator Co. and include more than 25 miles of copper tubing plus 30 miles of thermocouple wiring which house and inform us from all parts of the laboratory on the exact life of the containers to read.

Controls are of the "passive" type—monitored on all interlocks which prevent any part of the laboratory's machinery from being started until all operating requirements have been satisfied.

Exposers do not control any of the machines, they merely give permission to the spot operators to set it in motion. They act as conductors to assure that all parts of the complex laboratory function as a team.

Any emergency can be spotted immediately in the supervisory control room and pressing a single button can shut down the entire train.

Laboratory personnel in unidirectional soundproofed control centers located close to each test cell operate the engine, watching the tests both through elaborate instrumentation and physical observation.

The indicators on the control room panel check 145 temperatures throughout the facility. Those hundred other temperatures are only verified by a standard dial telephone which reports, in numerical code, to the control room.

Chemistry associated with corrosion



TURNBOKOP test cell with various platens in stock, variable column inlet thread at right



ALTITUDE TEST CELL. Once temperature within (lower T & higher) have settled



DETAWAY division of altitude and will show selected features and its flow.

THE WORLD'S LARGEST
PRODUCER OF
READY-TO-INSTALL POWER
PACKAGES FOR AIRPLANES
INVITES YOU TO ENJOY YOUR
WORK AND YOUR LIFE IN

beautiful
SOUTHERN
CALIFORNIA

We believe we can offer you an opportunity to improve your position in the business world—and improve your way of life here at Rohr Aircraft Corporation in beautiful, temperate, exciting Southern California. To strengthen our personnel in various departments, Rohr has a real opportunity for you if you are skilled as an—

ENGINEER
(Aircraft Design or Structures)
LOFTSMAN
JIG & FIXTURE BUILDER
TOOL PLANNER • TOOL DESIGNER

ROHR
AIRCRAFT CORPORATION

Please write giving complete details and we will answer immediately.
Mr. Neal DeVitt, Personnel Department 30
Rohr Aircraft Corporation
Chula Vista, California

Write each of five days on every five days

outside diameter of the powerplant being tested, with the area between the fixed part of the engine and the air wall of the test cell. This directly allows air into the powerplant's intake and prevents dilation of exhaust sections with test pressure.

At present, the altitude cell will not handle jet engines equipped with afterburners because of the risk of detecting false afterburner detection. Plans are under way to install water spray curtains to break the detection and clear out the detectors.

The cells can also be used to test jet engines with air under ambient temperature and pressure conditions. The center sections have air lock doors to permit entry during engine operation. Deformation caused by mounting heavy jet engines on a cantilever platform about 10 ft. long creates an alignment problem between telescoping center section and fixed front and rear parts. Future altitude cells will have hinged instead of telescoping across sections.

Sea Level Tests

The sea level test cells can also operate on either conditioned rates or at ambient atmospheric and accommodate engines with or without afterburners.

Engine exhaust, instead of being circulated by exhausters, is directed into a sound attenuation chamber which reduces the load due to the level of an automobile exhaust.

Engine coolers are furnished of low flow steel tubing. Provisions have been made to circulate cooling water through the tubing to cool heat from the engine because two exhausts.

Four water spray rings are directly behind the engine to cool the exhaust and prevent air heat from damaging the sound attenuation material.

The automatic Minneapolis-Honeywell equipment runs at the first speed ring when temperature reaches 280°F. Incomplete ring go into operation as temperature climbs to 460°F, at which point an alarm is sounded.

The telescoping test cell can test engines with conditioned or ambient air and under high-altitude conditions. Popcorn form or ambient air only.

Prigs flow in air through 10 ft. high stainless bellows and a variable orifice inlet whose circumference at the propeller end can be adjusted from 9 to 10 ft. Prigs is to eliminate inlet buffeting around prop tips. The whole outlet structure can be moved back and forth to accommodate turbo-prop engines of different lengths.

Engine exhaust is drawn into the exhaustor wing. Prig waste is blown through a sound attenuation chamber where noise is reduced to a level equivalent to hearing the turbo-prop door roller ring.

The engine is mounted on a cable



OLIN SOLID PROPELLANTS
ARE READY FOR USE IN THE
FOLLOWING APPLICATIONS

- Missile Propulsion Units, Boosters and Sustainers, KFO Motors
- Solid Propellant Turbo Jet Engine Starter Cartridges
- Gas Generators and Auxiliary Power Units
- Power Packages for External Stores, Canopies and Pilot Seats Forward Ejection Systems
- High Explosives, Ignitors, Fuels, Detonators, Primers, Pyrotechnics
- Explosive Formations of Metal Parts

a helping hand

UP
or
OUT



McDONNELL-DUGLASS

Armament Jetting Developments by the
Explosive Division of the OLIN MATHIESON
CHEMICAL CORPORATION Have Proven to be
Ideal Solutions to a Variety of Jet Age Problems

Many tough missile and aircraft problems have yielded to speedy solutions with the speediest aid provided by Olin Explosives Division experts. Recently, new developments by leading missile manufacturers have greatly been expedited by the unmatched knowledge and know-how Olin continuously places at the disposal of a manufacturer. If there is a possibility that any of your own problems can be answered through a novel re-utilization of solid propellants or explosives, a call to Olin Alton today may well prove an important step to a rapid solution.

Olin

TRUST
EXPLOSIVE DIVISION

**OLIN MATHIESON CHEMICAL
CORPORATION**

ALTON, ILLINOIS

the industry's choice for
better fabrication...

AVIATION FABRICS

to specification by

Sawyer

...for highest quality
canopy covers...
interior trim...insulation

Backed by more than 100 years of extensive laboratory facilities in the hands of expert research engineers—SAWYER'S Coated Avionic Fabrics are the standard for the highest quality product available to the aircraft industry—vulcanized fabrics, rayon, glass cloth and other specialties. Contact your nearest representative or write us for samples at our Specialty Avionic Interior and Exterior Coated Fabrics as well as our up-to-date literature for interior trim with our Aircraft Finish—manufactured in all types, colors, weights and suitable for government and AAF specifications.

THE H. M. SAWYER & SON CO.
Coated Fabrics Division...Established 1840
WATERTOWN 72, MASS. WATERTOWN 4-0520



FOOD BRAND

NEW YORK: Walter J. Smith, 18 Red Star Dr., Albany NY 12201; William S. Judd, 12 West 24th St., Albany NY 12209
ALBANY: William J. Smith, 18 Red Star Dr., Albany NY 12201; William S. Judd, 12 West 24th St., Albany NY 12209
COLUMBIA: Lee J. Smith, 2111 Centre Street, Cherry Hill NJ 08002; William S. Judd, 12 West 24th St., Albany NY 12209
DETROIT: E. J. Smith, Inc., 1001 E. 14th St., Detroit MI 48202; William S. Judd, 12 West 24th St., Albany NY 12209
LOS ANGELES: John J. Smith, 214 South St., Los Angeles 7-2157; William S. Judd, 12 West 24th St., Albany NY 12209



LARGE-SIZE refrigeration piping leads to intercooler (left) and test wing (right).

supported steel which is equipped with a thrust-measuring mechanism.

In the area between the test cells and exhausts wing are three specially designed cooling—air and one for the turbo-prop engine exhaust. They can handle temperatures from 3,000 down to 173°F in the space of a few feet.

Exhaustor Wing

The exhaustor wing which is currently being installed in the test cell, consists of two large horizontal ducts. In the first stage, low air ducts, each powered by a 1,500 hp electric motor, can insulate altitudes up to 25,000 ft. In the second stage, low exhaustor driven by 5,000 hp, insulates, being the altitude up to 45,000 ft. In third stage, a single exhaustor requiring 5,000 hp, takes test cell altitude to 65,000 ft.

Other equipment in the building is electric air conditioning, water and an exhaustor air conditioning system to maintain the building. All exhaustor air purging equipment is interconnected by large-diameter ducts and air flow is controlled by automatic gate valves—some three stories high.

As in the blower wing, almost of the building's floor is a continuous metal grating.

New Additions

New additions described those additional details of equipment, either under way or planned, for NATTS.

• Blower wing will be extended to accommodate one additional blower and motor equal in capacity to each of the three now installed.

• Altitude test cell capacity as the design stage will be somewhat larger than the two existing cells to handle large turbo-prop engines. Associated equipment will also be able to create higher

temperatures—up to 1900°—in altitude can heat air. Design of the cell itself will differ from existing cells in that hanging rather than telescoping tubes will open the chamber.

• Environmental test cell is being planned to subject gas turbine engines to a variety of severe climatic conditions.

• Accessory test cell, where engine accessories will be subjected to the same temperature and altitude extremes as the engine themselves, is in the planning stage.

Auxiliary Facilities

Auxiliary facilities of NATTS include a pumping station on the Delaware River two miles away, with capacity of 5,000 gpm. Water is pumped through a 28-in. main to a water treatment plant from which it is piped to a 1.2-million-gal reservoir. Above the reservoir is a group of 12 water towers, each equipped with a large-diameter cooling fan. With internal ambient temperature, each tower has a capacity of 5,000 gpm and can drop water temperature from 75°F to 60°F. Fresh-water, stainless-steel, concentric pipes bring water to the towers from the facility's various intercoolers, test exhaustors and exhaust stacks under a pressure of 100 psi.

Recirculation of cooling water through the towers means that the pumping station needs only to replenish water lost through evaporation.

NATTS also has an electric substation with capacity 13,326 kva. Current is piped through underground cables made of oil and nitrogen.

The aircraft Navy's aircraft test cell is under military command, but most construction under the Commander, Naval Air Development Center, Naval Air Development Center, Johnstown, Pa., jurisdiction under the Fourth Naval District.

School Expands

Bo de Jernon, the Institute Technology & Aeronautics, Inc., is one of NATTS with the emphasis on aeronautics, has begun an important expansion program. New projects include an airport with one and one-half mile long landing strips, an all-weather wind tunnel and an engine driven wind tunnel from a World War II Packard Rally Rover engine engine located in the U.S.

P&W Increases Space

Pratt & Whitney Aircraft plans to double the production space of its North Haven Conn., plant. The company expects the addition—500,000 sq ft of production floor space and 100,000 sq ft of office floor space—to be ready for occupancy by mid 1956.

One-Half the Size
One-Third the Weight
of the Standard BNC!



MINIATURIZED

NEW DAGE DM SERIES COAXIAL CABLE CONNECTORS

- weatherproofed and sealed
- quick disconnect
- vibration proof
- mechanically rugged
- withstand extreme temperatures
- heavy silver plating
- can be adapted to any mission cable
- requires no special tools for assembly
- all general types available

Please write for samples and detailed information

DAGE ELECTRIC COMPANY, INC.
BIRCH GROVE, INDIANA



For SUPERIOR PERFORMANCE
in the Air



For
DEPENDABLE
SERVICE



in the Field

Across the country, GECO's field service engineers are quickly available to assist our customers with expert application engineering and supply on-the-spot information. Acting as liaisons between our West Hartford plant and aircraft and engine manufacturers everywhere, these specialists also bring important information from the field to our design and production departments that helps us anticipate and better meet the fast-changing needs of the aviation industry.



FOR A MORE COMPREHENSIVE PICTURE

of all the Chandler-Evans Pumps, Fuel Controls, and Accessories, send for your copy of the GECO Circular, "Engineered For The High And The Mighty" . . . or simply write outlining your fuel control problems. Our engineers will be glad to work with you to help build new standards of performance into your next design project.



Hand it to CHANDLER-EVANS . . .
for Development

ONLY GECO MANUFACTURES COMPLETE FUEL PUMPING AND CONTROL SYSTEMS . . .

. . . Pumps, Main Controls, Afterburner Controls, and Accessories . . . all engineered to work together as a perfectly coordinated team!

GECO's fully integrated facilities are available to carry your project through from concept to finished product. Included are: CREATIVE ENGINEERING — with the talent, knowledge and experience to develop newer, finer designs; MANUFACTURING — with the ability to produce components with the extreme accuracy essential to high performance levels; TESTING — more than adequate facilities for fast-tracking research and rigid final inspection. These are some of the reasons why . . . wherever progress in the air demands finer, more advanced fuel pumps and controls . . . you'll find a better answer when you hand your problems to Chandler-Evans.

DUAL FUEL PUMP



MAIN CONTROL



AFTERBURNER CONTROL



CHANDLER-EVANS
WEST HARTFORD 1, CONN., U.S.A.

HIGHER PROGRESS OF

JET ENGINE FUEL CONTROLS • AFTERBURNER CONTROLS • PUMPS • SUPERCHARGERS • CARBURETORS • PROXY PLUGS

NOW

molded printed electronic circuits

Improved circuit plate assemblies are available from IRC. Combining unsurpassed experience in producing film type composition resistors and precision molding skills, IRC again sets the advance of electronics. Type MCR Printed Electronic Circuits are fully protected by an exclusive molded enclosure. The entire assembly is a sturdy, compact, weather-resistant ideal for automation.

Type MCR features

- greater moisture resistance
- less lead-life change
- uniform treatment spacing
- unaffected by vibration
- compatibility placed
- better temperature coefficient
- no possibility of "shorting"
- easier loading

Typical applications

- vertical integrators
- supply circuits
- slide filter circuits
- noise coupling circuits
- tolerance converters of audio amplifiers

Standard Component Features:
• Controls & Potentiometers
• Resistor and Standard Control Functions
• Power Resistors
• Precision Wire Wound & Film
• High and High Voltage Resistors

Wherever the Circuit Says
Harmonic Testing Test Inductance
Resistor Wire Wound Resistors
Resistors & Slugs and Glugs
Resistor Multiplier & Material
Resistor Quartz & Ceramic
Resistor Quartz & Ceramic

IRC



Designed for Automation



Packaged for Automation

SAVE COUPON FOR
IRC DATA PULLER

INTERNATIONAL RESISTANCE CO.
Dept. 113 461 N. Broad St., Philadelphia 8, Pa.
In Canada: International Resistance Co., Ltd., Toronto, Ontario

Send Bulletin describing IRC's Molded Printed Circuits

Name: _____
Company: _____
Address: _____
City: _____ State: _____

AVIONICS

High-Temperature Receiving Tube Introduced by General Electric

By Philip J. Kloss

General Electric has announced the development of a tube (about the size of a transistor) containing an electron tube capable of withstanding the extremely high temperatures and shock loads in aerospace aircraft and missiles.

Although the first tube type available, the 6BY5, is aimed at the television receiver market, GE officials plan to develop a full line of micro-miniature ceramic tube types for missile and other electronic applications. Some of these units could be available in 12 to 16 months, a company spokesman told Aviation Week.

The unit is a high-vacuum, low-noise triode capable of operating up to 500 m. Samples have been operated successfully at 500C for more than 500 hr. Subjected to standard shock and mechanical tests, the 6BY5 has failed to yield any measurable microphone output, GE says.

However, it is the 6BY5's high gain, low-noise, high frequency characteristics which make it attractive for use in UHF television systems, GE says. The new tube is expected to cost TV manufacturers around two dollars, a company spokesman says.

Stacked Construction

In external appearance the new GE tube resembles the stacked ceramic receiving tube developed by Edsel McCullough (AV Aug. 12, p. 61). The GE system is considerably smaller than the Emurc tube since it must operate at higher frequencies and has a lower power rating.

The 6BY5 measures only 1/2 in. in diameter and 1 in. in length. The ceramic base, made of alumina, is about 1/2 in. in diameter and 1 in. in length. However, future line frequencies, high-power versions of the GE tube may be somewhat larger than the 6BY5.

The tube is built up from three ceramic sections which support and isolate two aluminum "sockets" and a titanium grid-cup which functions as the tube's shield (see photo, p. 72). The titanium sockets serve as a means of support and external electrical connection to the tube's electrodes.

GE is sensitive about the process, developed by its research lab, which is used to weld the ceramic and titanium and to evacuate the tube. However,

a spokesman says that the tube remains tight at temperatures above 700C. Titanium finds its first use in vacuum tubes but two very important reasons.

- **Easily degraded.** GE discovered that titanium, unlike many other metals, need not be heated to 700C for a short period to release its internal gas.
- **Thermally sensitive.** Increases in temperatures produce a further gain. This is important because gas sealed into a vacuum tube, or released after baking, causes deterioration of the cathode oxide coating, shortening tube life.
- **Excellent "gettering" properties.** Titanium cleanses the seal of the ceramic "getter" because it absorbs gases within the tube.

Characteristic Advantages

- Many of the 6BY5's advantages over its glass envelope predecessor stem from its planar micro-miniature size and novel construction. For example:
- **Reduced surface area.** At very high frequencies there is less direct exposure to external electrical fields, possible by the titanium sockets. This

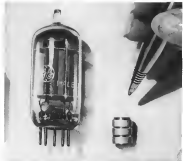
Far From Dead

"Since the revolutionary development of the triodes, there has been a trend away from vacuum tubes to solid state in some quarters to assume that the vacuum tube is a dead duck. Often thoughtful persons have expressed concern that research and development on vacuum tubes might become neglected in favor of micro-conductor research.

"But the reasonable expectation of immediate, almost universal, replacement of vacuum tubes by micro-conductors—and thus phenomenal high-temperature behavior—while the triodes can not even approach, shows that the vacuum tube is a far from dead."—Dr. C. G. Sells, vice president and director of research, General Electric.

eliminates the long leads running from electrodes to bias pins employed in conventional tubes.

- **Reduced coupling between cathode and plate sockets** from effects of shielding provided by the grid and its titanium support.
- **Reduced inter-electrode capacitance** results from the use of extremely small electrodes.
- **Rapid electron transit time results** from the extremely close electrode spacing. For example, when the tube is operating, spacing between grid and cathode is only 0.006 in. However, a GE spokesman says, this spacing may have to be increased for tubes designed



CERAMIC RECEIVING TUBE (at right) is smaller than conventional vacuum tube (left).

DARNELL CASTERS & WHEELS

GIVE LONG YEARS OF
PEAK PERFORMANCE

Here's Why

SMOOTH TREADS . . . a wide choice of treads suited to all types of floors, including Duroplastic tile, water and chemical resistant treads, rubber Darnell Casters and Wheels highly adapted to rough usage.

RETI-PEDDING . . . by slow gliding, Darnell Casters give longer, carefree life wherever water, steam and corrosive chemicals are freely used.

STEERING DEVICES . . . Even though spring and leveling may add weight to the load, these spring guides insure easy rolling at all times.

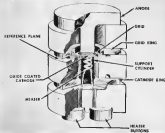
LUBRICATION . . . all casters and wheel bearings are factory packed with a high quality grease that "breaks up" under attack by heat and water. Such fittings are provided for quick grease-gun lubrication.



**ASK FOR FREE
MANUAL...**

describing over 4000 types of Darnell Casters and Wheels—with ratings and trends for every kind of application.

DARNELL CORPORATION, LTD.
10000 10th Avenue, New York 26, New York
In Canada: Darnell Corporation, Ltd., Toronto, Ontario



INTERNAL CONSTRUCTION DETAILS of GE micro-wattage ceramic tube, type 6BY4.



SMALL SIZE of elements in the 6BY4 is emphasized when glass clamping pins are used.

to operate under vibration and shock, constructed in aircraft and spacecraft.

GE has released following figures on performance characteristics of its 6BY4, increased to 900 mc, in a grounded grid circuit, with 10 use: bandwidth.

- Power gain: 15 db
- Noise factor: 5 db
- Amplification factor: 100
- Transconductance: 4,000 micromhos
- Plate voltage: 300 v.
- Filament: 5.1 v.

Future Plans

GE officials say, future plans for ceramic and military vacuum-tube ceramic tubes include low- and high-meg

types, as well as power amplifiers, in both triode and cathode-coupled types.

Another project in the GE agenda is to develop mechanical assembly techniques and machines for fabricating its ceramic tubes, which at present must be assembled under microscopes.

Born from the standpoint of size and internal construction, the GE ceramic tube appears far cruder adapted than the glass and silicon ceramic tubes to mechanical assembly.

However, from the standpoint of mechanical placement of the completed tube in general circuit boards, the GE tube appears to have a very slight advantage over its low competition.



INTERNAL LAMPS RAISE AMBIENT TEMPERATURE TO +125°C.

NEW G-E TANTALYTIC* CAPACITORS OPERATE AT +125°C AMBIENT

Available in ratings from 36 uf at 100 VDC to 180 uf at 30 VDC

Designed to operate at +125°C for 1000 hours with not more than 10% loss in initial +35°C capacitance, General Electric's new high-temperature Tantalum capacitors meet the tough requirements of man-made military equipment.

POWELL CONSTRUCTION ensures the most long life, high quality, and stable operating characteristics provided by +60°C Tantalum. Unlike other types of Tantalum capacitors, the POWELL construction also offers:

- A built-in self-healing mechanism, minimizes excessive leakage.
- Chemically resistant elements — minimizes corrosion damage.
- Excellent mechanical stability . . . insures long electrical value under shock and vibration.
- Excellent stability of rated capacitance . . . extended life at temperatures below +125°C.

AVAILABILITY: G-E high-temperature Tantalum capacitors can be obtained now in sample quantities for evaluation and prototype use. Production lots will be available by September in the following standard ratings:

Value	of Case 1 1/2" x 1/2" x 1/2"	of Case 3 1/2" x 1/2" x 1/2"	of Case 5 1/2" x 1/2" x 1/2"
36	100	100	100
47	100	100	100
68	100	100	100
100	100	100	100

For more information, see your GE Application Sales Representative or write for Bulletin GE-A-4014, General Electric Company, Boston 410-01, Schenectady 5, New York.

*Any modification of General Electric's

Progress Is Our Most Important Product

GENERAL ELECTRIC

MAXIMUM VOLTAGE (over 125°C) can be applied . . . with no loss of life . . . at ambient temperatures below rated +125°C in direct current.



A new G-E record—J47 engines on F-86F's are now accumulating . . . 33,000 hours per in-flight shut-down

Another record for reliability has been set by General Electric J47 jet engines.

From January, 1953–December, 1954, all J47's powering North American F-86F's amassed a total of 33,000 flight hours for each incident requiring engine shut-down. Inclusive of G-E powerplant dependability, this mark was set despite casualties in Korean action.

In the same two-year period, the J47 enabled Boeing B-47 Stratojets to run up a mammoth 24,000 engine operating hours per shut-down. During this time, B-47's logged a total of over 1,200,000 hours in the air.

Compared to commercial and military piston engine operations, this new record shows that the J47 averages about twice as many engine flight hours per shut-down. Such reliability, plus

simple design, points the way to more and more applications for G-E jet engines.

5,500,000 MILES A DAY—Each day at USAF bases around the world, G-E J47's are flying over 5,500,000 miles, or the equivalent schedule of an airline with 348 four-engine transports.

Analyzing, recording and applying this unmatched operating experience (see below), General Electric has been able to deliver steadily better production engines to our Armed Forces and—most important—faster development of new powerplants.

Looking ahead, for example, G-E is now testing an engine designed for supersonic speeds. And even more advanced powerplants, both jet and piston, are in early development stages—another reason why, at General Electric, "Progress is our most important product." GEO

Progress Is Our Most Important Product

GENERAL  ELECTRIC

WHY J47 OPERATING RECORDS MEAN BETTER G-E JET PERFORMANCE



BATTERY OF IBM MACHINES CONSOLIDATES FIELD REPORTS which are then analyzed by G-E statisticians. Complete information on each part of all reported engine malfunctions is G-E's support to improve existing powerplants, as well as accelerated long-range design advances.



DESIGN IMPROVEMENTS ARE QUICKLY APPLIED TO HARDWARE at G-E engine plants. Over 30,000 such improvements have been made in the J47, many of them before overhaul in 1200 hours on some models. Field service analysis has been a major factor in achieving this record.



INCREASED AIRCRAFT AVAILABILITY, reduced maintenance time and costs are important benefits of G-E engine analysis. Top Air Force operational ratings, the J47 will have logged over 5,000,000 flight hours by December, 1955.

VITAL TECHNICAL INFORMATION ON ENGINE PERFORMANCE is gathered by G-E tech reps at military bases in 16 countries. Their regular reports, sent back to G-E, include operating record of each engine, servicing problems encountered, recommendations for improving reliability and performance.

now

Supercharged performance



MORE SPEED—230 m.p.h. @ 70% power (260 m.p.h. maximum). **MORE RANGE**—1400 miles normal range (1600 miles maximum). **MORE LOAD**—7,000 lbs. gross (7350 lbs. useful). These are but three of the outstanding features in the new supercharged

AERO Commander Super
-680-Super

For complete information use your nearest Aero Commander distributor or write for Catalog 128-5

AERO DESIGN & ENGINEERING CO. • TULARE AIRPORT • P.O. BOX 118 • REINHART, OKLAHOMA

New Avionic Equipment Proposed As Aids for Air-Traffic Control

Washington—Confronted by the necessity of even greater airspace congestion, delegates to the Radio Technical Commission for Aeronautics have proposed and recommended new Avionic equipment and techniques for safely controlling the increasing numbers of new and faster aircraft. Among the various proposals:

- Development of new light plane VHF receiver incorporating a wider range of channels to speed up tower-to-plane communications.
- Modification of flow-control procedures to give planes with the greatest number of communication channels priority.
- Continued expansion of the Civil Aeronautics Administration's "lightplane" or "general" VHF facilities enabling air route traffic controllers to talk directly with aircraft several hundred miles away.
- Development of an air traffic control signaling system (ATCS) capable of transmitting instructions, weather maps, etc., to individual aircraft.
- ATC transponder beacons to replace the potential of ground radar as an air-traffic-control device.
- Installation of an autopilot approach complex that automatically fits an airplane down the ILS localizer and glide slope beams (General Air Lines already has a number of these installed in their planes).
- Formation of an air traffic control aid forum to assist Air Navigation Development Board engineers on a continuing basis.

The proposal for the establishment of an air traffic control advisory team was made by Sam F. Saint, veteran airline pilot and consultant to the Air Navigation Development Board. Far detailed account of his views on the problems of traffic control—and the equally strong ones of Lt. Gen. Joseph Smith, commander of the Military Air Transport Service—see Aviation Week, July 30, p. 15.

Frank C. White, a member of the Air Transport Association's air navigation and traffic control group, called for the development of new communications "equipment for light planes. Pointing out that the aircraft are but replacing their fleets with new VHF receivers with 50 kc. channel spacing to double or quadruple the number of channels available," White told RTCA that the lightplane operator who wants to fit into congested terminal areas under instrument (IIR) conditions must be able to increase the number of available channels in his radio equipment. Most of today's lightplane radio trans-

mitter have only six to eight communication channels as compared with the 400 channels used by the airlines on new "heavy" VHF sets.

A lightplane carrying a congested terminal area must communicate continuously with approach control, local control and, eventually, precision radar control equipment. At each step, the lightplane operator must transmit his VHF non-crystal controlled receiver normally, frequently using the same for a "voice circuit" to be sure of a properly received message. The result is increased delays in the entire system, White said.

Industry Challenge

White challenged the aviation industry to develop a receiver (SSB-400), lightweight portable VHF set, crystal-controlled, capable of operating at each and every 100 kc. channel between 116.1 and 120.7 mc. Recognizing that the world probably requires the use of crystalizing circuitry, now employed in the more expensive airline-type equipment, White said that an acceptable alternative would be a 30-channel

set whose channels could be changed easily to any required frequency merely by plugging in new crystals.

He also suggested a modification of the present flow-control word order advice (FR) condition, in which aircraft may be prohibited from entering or leaving a congested terminal area until the traffic control system "tells" them up. White suggested that these conditions might first be worked out on the basis of an individual aircraft's communication capability in a plane with more communication channels would be given priority over one with only a few channels.

Tim White believes would not only use congestion of over-crowded radio channels, but would provide incentive to lightplane operators to increase their radio capabilities.

Max Kistner, of the Aircraft Owners & Pilots Assn., replied that it should be possible to expand communication capabilities of portable sets to meet their operational needs, but he cautioned against mandatory increases in channels for all portable equipment. Kistner pointed out that portable transmitters would be used by 100,000 AOPA pilots from two major manufacturers and that these should not be dominated arbitrarily.

John H. Hiltner told the RTCA that the increasing use by the CAA of long

Tacair Status Report

Two major investigations which now determine whether Tacair becomes the nation's Common System navigation aid are scheduled to be completed within 60 days, according to Col. J. F. Taylor, Jr., director of the Air Navigation Development Board. In his status report to the RTCA, Taylor said:

- Determination of the number of radiofrequency radio channels, under way at Air Force headquarters. Laboratory should be completed by Nov. 1.
- Airport coverage survey requirements to provide nationwide service from as few as 75,000 but not less than 15,000 to 17,000 ft. is complete. Studies of coverage survey data to the earth's surface is under way. These results have not been made public pending completion of the number of available radio frequency channels.
- Channel requirements for Tacair to enable it to provide the desired service and use type service is under study by the National Bureau of Standards and should be ready by Nov. 1. In making the determination, NBS must establish what Tacair performance may be expected in the 1960-70 period, including the performance from low power Tacair stations with ranges of 30 and 100 miles. Channelization and performance measurements which can be used to predict the performance, in both active and private type equipment are being obtained by VLE and NBS requests.

Taylor reported that the Joint Chiefs of Staff has furnished ANDB with a state report which, in effect, orders the military equipment for Tacair to meet the needs of the continental air defense system.

The CAA's National Development Center is developing the military Tacair ground station equipment (GND-15) to make it suitable for common system use, including such things as power line dual equipment with automatic interlocks in case of failure. Taylor reported.

He said he believes that the message and DME functions of Tacair should be made available to civil users on a separate-function basis, and that a lightweight, low-cost Tacair receiver should be developed. (Federal Telecommunications Lab has demonstrated such a unit.) However, Taylor remarked that the research having receiver available from Tacair should not be seriously completed in such low-cost models.



Before you decide who's going to build it...

You're wise to get a bid from BLISS

The reasons are quickly summed up: flexible manufacturing facilities backed by long experience and a record of remarkable performance on past contracts, both government and

civilian. Whether you want a few hundred-ton units or many thousands of non-flammable weighing a few pounds each, be sure to check with Bliss before you buy.

BLISS offers you... the experience gained in the production of equipment like

- aircraft carrier catapults
- 20 ton machine guns
- gas motors
- steamship machinery
- torpedoes
- shells
- tank cupolas

plus facilities that include • 11 U.S. plants—two million square feet of floor space and, at present day values, about a \$44,000,000 inventory of machinebuilding tools • Four facilities grinding steel, iron and black-oxide castings, including the largest and heaviest types • Two building departments with equipment to cut out, weld, paint and assemble subassemblies weighing hundreds of tons.

Mass and precision: it's a large lot of steel being cut at Bliss Center Plant in need to build machine blower valves for 50,000 no. 6 guns. Shown above, an air-tight receiving gap checks these expensive valves in the chambers of tanks for 28 ton machine guns. Operations are held to 0.001".

BLISS
SINCE 1937

R. W. BLISS COMPANY, General Office: Canton, Ohio
CAMPAIGN • AIRCRAFT GEAR • MARINE GUNS
NAVY GUN MOUNTS • SPECIAL MACHINERY

It may take a minute... it's a guarantee

Plants at Canton, Cleveland, Selma and Toledo, Ohio; Denver and Hastings, Michigan; San Jose, California; Milford and Pittsburgh, Pennsylvania; & W. Pitts (England) Ltd., Derby & W. Pitts Co., Leeds, France.

range order for traffic control units such direct communication even more important.

Present GAA plans call for the installation of 64 additional peripheral VHF (and UHF) systems by 1960. Another 46 "high-altitude" installations are planned to give maximum possible line-of-sight range.

Each individual VHF frequency, 100-ton unit, will be paired with a discrete UHF frequency (used by the military service).

This will enable pilots to hear all com- munication between ground controllers and other aircraft in the area, both civil and military.

"Private Line"

Vernon Wehr reported that an air traffic control signaling system (ATC/S), capable of transmitting various instructions, whether major or a simple order of a ground radar scope to individual aircraft, relating over local voice channels, is now in the testing stage. The information will be displayed on the cockpit on a light- storage-type cathode ray tube, such as those developed by Hughes, Radio Corporation of America, Fairchild and Rockwell.

The Midway ATC/S system also operates with conventional VHF equipment, through the addition of suitable altimeter, Wehr said. Information transmitted from the ground is entirely "addressed" to the individual aircraft for

which it is intended and is not displayed to the cockpit of other aircraft.

Wehr indicated that the airplane's ATC/S altimeter could be set up to transmit back to the ground information on the plane's bearing, distance and altitude when such life information.

The Midway ATC/S system requires a bandwidth of 500 to 1,000 cps, depending upon the quality of picture required in the cockpit for presentation of maps and similar information.

Although Wehr did not indicate how far off the operational use of ATC/S might be, Frank White announced that the "private line" is at least five to seven years away—even if several major agreements today on what the system should be.

Bomber Becomes Progress & Problems

Although all civil and military agencies agree in principle that ATC transponder beacons hold considerable promise of improving the efficiency of ground radar for air traffic control, certain problems must first be solved before the new and complex mid-range, S-B. Puntney, of Aeronautical Radio Inc., told the group.

Puntney read a GAA statement which reported that significant, unsolved problems (a) ... control the actual status of communications." The GAA's Technical Development Evaluation Committee is attempting to work out some of the problems. If they are resolved, these will contribute to ASR.

radar in the New York area should be in operation by September 1955, with ASR installations to follow at Chicago and Washington.

Test beacons installations on long-range traffic control radar at N. Y. Lohrstown, Washington, and New York are also planned.

Moving Casually

If the GAA appears to be moving cautiously, some of the beacons system problems, which Puntney indicated, show who. For example, in congested terminal areas, airborne transponders will be interfered by ground ground stations, which may overload the transponders, effectively incapacitating them. For the same reason, signals to the transponder of one ground radar will be received by all others in the area and will appear on the latter's scopes as interference.

Another problem stems from the fact that the beacons system operates at 1,090 and 1,090 mc., right in the middle of the band assigned to Texas. This may lead to clearance from interference on the Texas system there too, and possibly adjoining channels.

A report on the study ATCA's Special Committee, 11 studies and United Air Lines committee's experience with out-of-airport approach complex suggests that more airframe and business aircraft will be equipped with these aids in the near future. The report came from E. A. Puck, superintendent of air-aid



Bell Wire-Wrap Process

A new approach to the automation of electronic equipment developed by Bell Telephone Laboratories makes use of SEL-developed sub-miniature wire-wrap process of attaching wires to terminals. Fishback of conventional wiring (above, left) is automatically handled by "M-47" sub-miniature machine (right) operating under computer control. Machine uses two rotating spindle-type pull wire from reel in a counter-clockwise direction, the other automatically cuts wire to desired length. Each spindle then retracts mandrel from wire ends of wire-wraps the bare wire around barrel terminal. Alternatively, spindles pick up wire from supply and make point connection. The BTL approach to automation was first described by Anthony Ward (Mar. 8, 1954, p. 44).



SPINS LIKE "BLAZES"— so Radiography checks each one



Radiograph of oil scavenger rotor in variable displacement pump for aircraft hydraulic systems.

Radiography...

another important example of Photography at Work

"BLAZES" is not the word—but suggests the rotor's shorter exposure for the rate at which the rotor spins. Fast is, repeat as high that the soundness of the casting is important in terms of safety as well as serviceability.

So radiography goes to work and plays its unique part. With no damage to the product, radiography looks inside the part and checks each rotor's structure. Only flawless parts will meet the strict requirements of service.

Proving soundness with x-rays has become common practice with more and more suppliers of quality castings. They know it helps build reputations for delivering only good work.

If you'd like details on how radiography can improve your operations, get in touch with your x-ray dealer—or write us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N. Y.

Kodak

NEW AVIONIC PRODUCTS

Instrumentation

● Self-heating potentiometer, Model EMF-N52, completely self-contained, can be used to indicate temperatures during flight, operating from the



monopole signals, or to indicate accelerations, operating from strain gages. Complete unit, including amplifier and indicator, weighs 1 lb. North American Aviation, Inc., Muscle and Control Equipment Dept., Downey, Calif.

● Pressure-to-frequency transducer, Series P100, available in absolute, differential or gauge types, for FM/EM telemetry use. Unit converts pressure measurement into a temperature-controlled varying inductance which in turn varies the frequency of an FM oscillator built into the same case.



Transducer can be applied for an standard subcarrier frequency, between 1.7 mcps and 70 mcps, with deviations of 75% or 15%. Model P112 (not shown) is designed for measuring true inertial positions. It also contains a built-in FM oscillator. Datas Engineering Corp., 1611 Aviation Blvd., North Beach, Calif.

● Remote sampling switch, Model AE-90007, for use with the AN/AK3 FM/EM telemetry system, consists of two poles of 60 contacts each rated at a sampling speed of 5 cps. Unit is driven by a 25 mdc motor with governor. Other models are available at other sampling speeds of 1 to 30 cps.



Hot operator, Herman Nelson Division, Avco Corp., Inc.

THIS HEAT EXCHANGER

of stainless steel for the Herman Nelson Portable Air Heater, "Aviation's cold weather friend", is another precision fabricated assembly made by Lavelle for military aircraft applications. At Air Force bases everywhere, the BT-490 Heater provides a ready source of heat for pre-heating engines, cockpits, and for constant maintenance jobs—wherever reliable space heat is required to help keep America's defense planes airborne.



Heat Exchanger, Stainless Steel, 18" dia x 24"

Extensive fabricating facilities, plus Government Certified welding technicians, has enabled Lavelle to produce over 6,000 of these complex assemblies, each requiring 26 separate curved aviation heat exchanger tubes. To ensure close tolerances and speed production of the many component parts of the unit, special tools were designed and made at the Lavelle plant. Complete inspection includes pressure testing of each unit prior to shipment to Herman Nelson. Simple or complex, Lavelle has the capacity to fabricate the precision parts and assemblies you need... whenever you need them.

A new brochure describes Lavelle's specialized fabricating services. Write for a copy without obligation.

Lavelle

LAVELLE AIRCRAFT CORPORATION • NEWTOWN, ROCKS COUNTY, PA.

Saving This Man's Time



Saves Sales Dollars

There just aren't enough hours in a day for a salesman to do an adequate selling job without help. In addition to time spent on office work and awaiting interviews, the growth and decentralization of industry has brought problems of increased travel time, more buying influences and more difficult access to plant personnel.

When you advertise your product or service, consistently, in business publications your prospects look to for help with their jobs, you multiply the calling power and increase the productivity of your sales staff. Business paper advertising can talk to thousands of prospects . . . can arouse interest in, and create a preference for, your product . . . at pennies per call.

Just as high speed machines cut production costs, well-planned business publication advertising cuts sales costs. It "mechanizes" the first three steps of a sale and lets the salesman concentrate his valuable time and talent on the all-important job of making the proposal and closing the sale.

Ask your McGraw-Hill man for a copy of our 20-page booklet, "Orders and How They Grow." Also about our new sound-slide film, "Pivotal of Progress" which is available for showing at sales and management meetings.



McGraw-Hill Publishing Company, Inc.



330 WEST 42nd STREET, NEW YORK 36, N. Y.



RECRUITATION FOR BUSINESS INFORMATION

MOBILE TEST EQUIPMENT For over ten years Farnsworth has participated in the design, development and production of precision and custom systems and special test equipment for such mobile programs as Troop Vehicle Squares and various "National Tests" on the field have been accomplished as a result of contributions in the form of accurate records, mobile systems, power supplies and complete system analyses.

INDUSTRIAL TELEVISION Special Model 1001 is the result of Farnsworth's more than 20 years experience in the design and production of complete mobile and industrial equipment—especially designed specifically for industrial, educational and business use.

IMAGE CONVERTER TUBES Used in any application where it is necessary to convert light to "heat in the dark." Come with an almost range in available image Applications: medical and life logical research, heli-scope observation, telescopic observation, color detection, security, and photography.

IMPROVED VIEWER This viewer comes easy to handle viewer is a valuable tool for crime detection, research and industrial applications. Clear vision of objects in areas in the dark is easily accomplished when they are illuminated by infrared radiation.

PHOTOMULTIPLIER TUBES Dependable in the most advanced systems for long sensitivities in both 100 and 1000 applications are known of optical vacuum Applications include photometric measurements for industrial and scientific uses.

IMAGE PROJECTOR A highly sensitive TV camera tube particularly well adapted for use as a slide or lecture projector. This tube can be constructed in a variety of types to meet special requirements.

RADIO BARRE GYROSCOPE A precision instrument incorporating both "bar" and "gyro" functions. The equipment operates on a radio frequency in the 100-1000 kHz range and can be incorporated into a series of radio sets for use in the field for the purpose of navigation. This sensitive radio device is accurately determined range.

PORTABLE CABLE TESTER Designed for testing of video frequency cables that will accommodate as can be adapted to type 100, 100, or 1000 impedance. It will supply a 4 k volt up to 1000 volts provided the correct drive in the light and correct range, it is also 1000 ohms peak into a load of 100 ohms at room temperature.

Farnsworth

vision... beyond the range of sight...

This is the Farnsworth iatron
the tube with SUN-LIKE BRILLIANCE AND MEMORY, TOO!

BRIGHTNESS: Display brightness up to 10,000 foot-lamberts. Ideal for projection purposes.

MEMORY: Image storage and persistence of view of memory duration. Operates over-extended.

RESOLUTION: Excellent detail. 200 TV lines.

Note: Dept. P-21 for complete details.

RESEARCH
Special Purpose, Small Research, Small Scale, Small Scale, Low Temperature, High Temp.

RADAR
Transmitter and Receiver, Long Range, Low Frequency, High Frequency, Low Frequency, High Frequency.

ELECTRON TUBES
Photomultiplier, Image Tubes, Image Tubes, Image Tubes.

MISSILE
Guidance and Control Systems, Test Equipment.

FARNSWORTH ELECTRONICS COMPANY • FORT WAYNE, INDIANA
a Division of International Telephone and Telegraph Corporation

NEW AVIATION PRODUCTS

Meter Handles Pitch Trim

New F-51H's handle meter designed for driving elevator pitch trim system at Douglas' supercruise F4D Skyway, has a holding torque of 2 oz. in. The unit is a 1/2 in. pitch variable motor operating at 11,000 rpm on the 115/230 v ac system, producing a holding torque of two oz. in. The unit has been tested in accordance with MIL-M-17663. Air Associates, Inc., Totobago, N. J.



Refueler Tests Fuel System

Fuel-A-Plane portable fuel system tester, designed for the Lockheed Aircraft Corp., permits the operator to test the single-point fuel manifold system of various jets or repeated aircraft at low pressures and flow rates. This is done without draining or venting or fuel tanks in case of malfunctions of any component part. If the fuel system checks out, the unit is used for filling the plane's tanks.

The tester and actuator is equipped with filter, air element, dropper and expansion pressure relief valve, fuel flow meter and three bonding cable reels, in addition to the air start-up, trapped, closed, open, and pump, air compressor, volume selector, fuel hose reel and meter and pressure gauge. Harman Equipment Co., 1605 E. Olympic Blvd., Los Angeles 23, Calif.

Spec-Type Aircraft Motor

Optimizing aircraft motor which weighs 15 lb. and delivers 1 hp. continuously at 7,100 rpm, provides a lightweight drive for Monitors, pumps and actuators.

The motor functions at altitudes up to 40,000 ft. with starting torque of 4.0 in. lb. Minimum burst and take-off data are standardized in accordance with military specifications. Designated Type A, the motor is designed for three-phase, 500-cycle, 200 v. operation.

U. S. Electrical Motors Inc., Aircraft Division, Box 1055, Trumbull, Conn., Los Angeles 14, Calif.



Pressure Regulator Valve

Absolute pressure regulator valve for paramotor tandem flows up to 40 cfm and maintains constant pressure at inlet temperatures in high to 150 F. The unit can be used on any jet bleed line to air turbine power ports, compressed gas systems and cooling systems or fuel tank pressurization and relief systems. Cossigny Controls Corp., 4100 Blvd., Farmingdale, L. I., N. Y.

Gage Measures .000001 in.

Capable of least least measurement in within one-thirtieth of an inch, the Link Progressor micrometer utilizes the wave-length of light as basis of measurement.

This micrometer may also be employed as a precision comparator with a full range of movement from the set position.

The Link Progressor unit consists of three separate units: a master ring head, control bar and bidirectional digital counter which displays the 1/100000th of the part being measured. The equipment can be used in measuring such items as pipe blocks, plug gages, ball and roller bearings and precision instrument parts.

Link America, Inc., Binghamton, N. Y.

Leer-Romex Makes New Pump

In a description of a new device motor drive mounted fuel booster pump, Model BG-11250 (AW Sept. 26, p. 76), the manufacturer's name and address was inadvertently omitted. Manufacturer of the new Leer, Inc., Lees-Romex Division, Elgin, Ill.

Starter Fits Under Super Sabre



North American Aviation, Inc., is using a new jet engine starter that is built so low it can be driven underneath the F-100 Super Sabre and start its J65/WA 107 engine on 34 sec. Unit can also be used as a pump bag.

Power is taken from a pump from a propane engine and transmitted to the turbojet by a hydraulic torque converter which provides a shockless power train. The unit also can provide 110 v. ac and 400 cycle ac power for aircraft.

The starter has four wheel drive and steering and has a 100-hp. turning

radius. Weight is 1,100 lb. Dimensions are 30 in. high, 19 1/2 in. long and 65 in. high.

The starter was planned by NAA and controlled engineer Don Coleman and detailed design has been built by Kollsman Corp., Los Angeles, and Electric Service Engineering Co., Dallas. The first units are being used by North American's F-100 flight operations department, and the company plans to get four more for other departments.

North American Aviation, Inc., Los Angeles 45, Calif.



A new Curtiss-Wright Research and Development Center oriented to Airpower of the Future

To implement today's most advanced aerospace plans, to stimulate and release the much greater power that the vastness of tomorrow requires... Curtiss-Wright has created its engineering organization to embark on a new research and development program of unprecedented scale at its 85-square-mile, heavily forested area of Pennsylvania, to which the Corporation has given the name of Quehanna. The site has been partly purchased, part leased for 99 years from the Commonwealth of Pennsylvania.

Here Curtiss-Wright is creating facilities which will enable power development to create a nation... will expand the frontiers of air travel and space travel... an advanced powerplant, undreamed of yesterday, take shape in the engineering imagination, on the drawing

board, and in production.

Curtiss-Wright's goal at Quehanna is to provide our armed forces with the finest in aircraft engines of every type... to provide our engineering firms with the power to transform their most advanced ideas into reality... and at the same time to reduce loadtime and costs, providing America with new air force, faster air force per dollar, sooner.

Control to air, land and highway transportation... to the other Curtiss-Wright offices and plants and the whole industrial East... to supply power and water supplies... and in Pennsylvania's highly skilled manpower area... Quehanna constitutes an ideal site for the significant new Curtiss-Wright facility.

ENGINEERS • TECHNOLOGISTS • SCIENTISTS

Curtiss-Wright has prominent career positions open for specialists in advanced engines and propellers, metallurgy, electronics, electronics, electronics, electronics and electronics. Now all names are Research and Development Center at Quehanna. Professionals and expanded division engineering programs are available opportunities for more engineers, technicians and scientists in both aviation and diversified industrial projects.

ALSO ON THE MARKET

Self-lubricating bearing material for missiles and aircraft. Space D-11 has proved successful in liquid oxygen and P-4 had bearing problems, under test. The material is self-lubricating from -90 to 1000°—Bosch-Cropper, Inc., 6949 Fenwick Ave., N. Hollywood Calif.

Nylon-encased aircraft nut bolt is of suitable 2 1/2" type. Buckle bolts has duct cut out for flush mounted rings. Available in dark blue, dark green, beige, grey and tan—Air Associates, Inc., Teaneck, N. J.

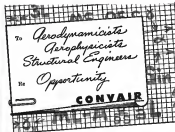
Shock-resistant plastic package for bearings can be molded with under all conditions and is used in aircraft, it's closed. Plastic vacuum formed shell contains the bearing, cut into an outer clamping sleeve of spiral wound fiber—Cargle Products, Inc., Brooklyn, N. Y.

Wire bristles with a diagonal pushrod and slender nose was especially designed for work in narrow, highly curved places. The new model is available in 12 in. length for straight line work and 24 in. length for branch and subassembly work—Ralph C. Robinson Co., Box 494-P, N. Sacramento 15, Calif.

Motor induction coupling drive provides stepless, variable speeds over ranges from 24 to 143 with constant torque output. Unit features high response, resistive accurate type and magnetic induction transmission. Motor runs at 3 1/2 hp at 1,740 rpm, and extends to 75 hp at 1,700 rpm—Arcon Co., Electric Motor Div., 7112 Cham Ave., El Monte, Calif.

Tensile 105, a vinyl plastic tubing meets fatigue and heat requirements at MIL-8516. The tubing is used in electrical equipment and electronic manufacturers and for continuous operation at temperatures to 180°C—Burgundy Co., Massachusetts Mining & Mfg. Co., 6 Apple Terrace, Irvington 11, N. J.

Thin-type device for automatically loading work pieces between centers and measuring the pattern when pressed can be adapted to a variety of small parts that can be rolled by gravity on inclined rails, permitting the operator to attend a battery of machines... Type CNG-1 semi-automatic, variable speeded gasless machine plays grade multiple diameter automatic workpieces on workpieces that do not load themselves in grinding in conventional multi-wheel machines... 68° Hypocap high production lapping



There is an important place for you at CONVAIR FORT WORTH if you have the qualifications and desire to perform varied essential work in these technical areas.

AERODYNAMICS

Lift and Drag Profiles of Aircraft and Rocket—Aerodynamic Loads—Stability—Performance—Interference of Aircraft and Missiles—Control—Flight Test Data Analysis

AEROPHYSICS

Stability and Control of Aircraft and Missiles—Analysis of Flow Control—and Shockwave Transmittance Systems—Systems Engineering—Infrared Detection—Aircraft Guidance, Radar and Missiles

STRUCTURAL ENGINEERING

Stress and Buckling Analysis—Structural Research and Development—Structural Design—Aerodynamics of Steady and Non Steady Flow—Plastic Model Design—Electronic Computer Programming—Relapse Profiles

Advanced openings also open in other technical areas.

As a division of General Dynamics Corporation, CONVAIR occupies an important place in the long-range development of the Nation's aerial defense as well as commercial aviation. CONVAIR's personnel afford defense and commercial opportunities for engineers, physicists and scientists to experience the excitement of technological advancement and personal growth.

At CONVAIR FORT WORTH you work in ideal, unconfined surroundings. A company-sponsored, complete program enables candidates to earn graduate degrees in Engineering. CONVAIR offers liberal travel allowances, profit incentives, excellent medical and retirement programs.

Fort Worth is the Great Southwest's top in education of students and dry, lush air conditions in outdoor living and recreation. Within a few minutes drive of Fort Worth are some of the best schools in the country for living and education.

For further details write M. L. TAYLOR, CONVAIR Engineering Personnel Dept., A Fort Worth, Texas.



CONVAIR
A DIVISION OF GENERAL DYNAMICS CORPORATION
FORT WORTH, TEXAS

CURTISS-WRIGHT

CORPORATION • WOOD RIDGE, NEW JERSEY



IMPORTANT INSURANCE FOR THE AVIATION INDUSTRY:

Our two new 8,000-ton presses are identical!

Kaiser Aluminum will soon have two new 8,000-ton heavy extrusion presses in operation at Hagerstown, Maryland, part of the Air Force heavy press program.

As both presses are of exactly the same size and capacity, Kaiser Aluminum is the only participant in the heavy press program that can assure you protection of production schedules.

Because the presses are identical, one may be moved from one press to the other without modification or delay.

As a result, regardless of any temporary shutdown of either of the two presses, production can continue without interruption. Air frame manufacturers and other users of heavy extrusions are thus insured against delays and disrupted schedules.

Company engineers should prepare designs promptly in order to ensure the required lead-time and benefit from the present early operations.

Kaiser Aluminum engineers with long experience in extrusions are available to work with you on your de-



sign. If you would like to see how heavy aluminum extrusions fit into your production, you are urged to take immediate advantage of this service.

Contact Kaiser Aluminum & Chemical Sales, Inc., General Sales Office, Painesville Bldg., Chicago 11, Illinois; Reserve Office, Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

setting the pace—in growth, quality and service

IMPORTANT FACTS ABOUT THE KAISER ALUMINUM HEAVY PRESS PROGRAM:

1. Maximum billet size will be 30" O.D., a 50' long. Retraction width—up to 17". Substantially wider extrusions can be produced depending upon section design. Maximum weight per piece will be 1250 lb. Maximum finished length will be 85 feet.
2. The use of these large extrusions will, in many applications, eliminate the costly production and assembly of several smaller component parts. This means potentially large savings in both money and man-hours to the aircraft, transportation, electrical and other industries.
3. The billets used on these presses will be made using electrolytic dearing and metal handling techniques—a Kaiser Aluminum first. Result: a new order of metal quality, freedom from gas porosity, highest degree of freedom from inclusions; soundest, highest quality extrusions ever made.
4. The new Kaiser Aluminum heavy extrusion plant is completely equipped and fully integrated for the production of heavy extrusions exclusively.

machine is designed for single or multiple heat treating. The unit can be arranged for a plan, timed cycle, automatic continuous feed, or semi-automatic continuous feed—Norton Co., Worcester 6, Mass.

Chemical balls quickly free open areas of hazardous ice and snow. Ice floes will not damage rudders, cowcatchers, or doors. Use water stream—Walton Mfg., 1915 Sheridan Rd., Highland Park, Ill.

Quads spring kit contains five co-springs that pressure against springs. Load increments range from 5 lbs. to 50 lbs. with maximum extension of 3 in. throughout. Helical springs are all supplied with lock-weld attach nuts—Universal Tool-and-Die Works, 2425 Broadway, Houston 6, Tex.

Boring bar is reported to reduce bending in bar deformation while making deeper cuts with heavier feeds by as much as 40%—It is constructed of steel and tungsten carbide in one ranging from 2 to 12 in. diameter—Crown Corp., 1980 Kipling Ave., Buffalo, N.Y.

Oil level sight glasses for helicopter transmissions are shockproof, resistant to corrosion and aging. Made of Kall F plastic, the sight glasses are standard equipment in all helicopters produced by Sikorski Aircraft Corp.—Nichols Engineering Inc., Shelton, Conn.

Scale-free welding equipment for aluminum piping eliminates the risk of pumping corrosion products or solid slag scale and scales into stretch feed tanks during arc welding operations. The scale-free equipment consists of two forged halves with lips each that fit pipe and welding fittings—Tube Tamer, Division of National Glander Co. Co., Lonsdale, Ill.

Griping, recently developed in Germany and now being manufactured in the U.S., forces tube into a shell without the use of splines or levering. Device is wedged between back and shell under heavy pressure head tool. Outer ring expands and the inner ring contracts—U.S. Automatic Corp., Warren, Ohio.

Nucalox pipe is a stainless steel brazing alloy pipe for the joining of heat and corrosion resistant alloys by torch, induction and similar methods. Its properties include excellent flow and brazing characteristics on stainless steel, nickel base alloys and mild steel alloys, as well as low alloy and carbon steel, copper and similar alloys, wetting point is above 1910F.—Green Stop-off prevents flow of

Edgewater

rolled steel

rings

for
jet engine
parts

- save machining time
- save costly material

Edgewater welded rings, rolled from solid steel blocks, are made in diameters from 5 inches to 180 inches, and weights up to 84,000 pounds. The cross-section drawings above show some of the shapes produced by the Edgewater rolling process. Simple or complex sections are accurately formed, maximizing machining operations, and reducing material costs.

Among the applications for which Edgewater Rolled Steel Rings are recommended are: thrust pins, shroud rings, compressor rings, spacer rings, parts for reciprocating engines.

WRITE for free booklet describing how Edgewater Rolled Steel Rings are made and showing some of the rolled sections produced by the process.



EDGEWATER STEEL COMPANY
PITTSBURGH 26, PA.

TOMORROW'S AIRCRAFT: *One step closer*

At Air Arm...
flight testing
is FIGHT testing

Air Arm has what it takes to develop and produce the best in airborne electronics equipment. A key factor is the Flight Test facility that tests systems through actual tactical situations . . . a facility that is second to none in the industry.

Far from being a fledgling in this activity, Air Arm's Electronic Flight Test Center is three years matured and still expanding. This unique facility is at the main plant and connected by taxi strip to Baltimore's modern Friendship International Airport, Westinghouse owned and operated, it consists of 48,000 square feet of hangar area, electronic test and administrative sections.

FIGHT Testing airborne systems is the job of Air Arm's Flight Test Center. Here, eight former military pilots, men with aviation backgrounds which total over a century of flying experience, keep as many as 16 prop and jet aircraft on the go. They select equipment to every possible airborne rig before it goes into operational service. 110 highly trained and experienced Flight Test personnel—engineers, technicians, mechanics, armers and aerologists are working hand in hand to insure that pilot, aircraft and airborne system form a perfectly matched combination for peak efficiency and performance.

Air Arm Flight Test is one of the many specialized facilities which enable us to produce the best in airborne electronics equipment and . . . to help you bring tomorrow's aircraft . . . One Step Closer. Westinghouse Electric Corporation, Air Arm Division, Friendship International Airport, Baltimore 27, Maryland.

Circle 2

Chief Project Pilot, Tom Lloyd and Fred Hughes, are on the ground, prior to takeoff, following to observe six-to-six gunnery check on a fighter armament system.

THE AIR ARM SYSTEMS FAMILY . . .

- Fighter Armament
- Bomber Defense
- Flight Control
- Missile Guidance
- Special-Purpose
- Systems Components

YOU CAN BE SURE...IF IT'S
Westinghouse



Airborne FIGHT Testing
is one of the many specialized
facilities behind you . . .

AIR ARM MAN WITH THE FACTS

Mr. M. T. Long

Can Mr. Long help you? Contact him at
Westinghouse Electric Corporation, 501
St. Paul Place, Baltimore 2, Md. Telephone
PLans 3-0900. Or use his counter part in your
area through your local Westinghouse office.



Bill Tyler, in charge of flight activities at the
Center, applies his experience to the operation of
flying test beds. In the Air Arm D-2 Flying Lab,
equipment gets a positive assessment of flyability.



Tom Lloyd, a chief project pilot, holds briefing
with project and supervisory engineers. Finding
the difference between simulated and actual per-
formance is the reason for Air Arm Flight Testing.



A new fire tested system is getting the Air Arm
shakedown, using the D-2 Flying Lab as the
testing ground. All equipment gets the evaluation
either actual in-flight tactical situations.



Complete support to operate flying test beds is
an integral part of Air Arm Maintenance in close
and all types of aircraft by experienced ground crew
using the latest equipment and longer facilities.

10-10000

YOU CAN BE SURE...IF IT'S **Westinghouse**



insuring alloy stress the surface of parts,
applied by brazing, spraying or dip-
ping—Stanley Processing Co., 241
Cameron Corp., 19145 John R St.,
Detroit 1, Mich.

Pressure bench cranks, weighing 10
lb., actuate shoulder devices on a
small (24 in. long) mechanical part
when placed upright against angle
surface plate and set up with one
manual feeder gauge—Tinsford Corp.,
Waverley, Montgomery County, Pa.

Seawater-resistant heat seal with single
welding length of 40 in. handles control
in laminated materials to government
specifications regardless of wrinkles or
splices in the material to be sealed. It
controls an automatic tugging device
that controls the heat-sealing cycle and
repairs single ply materials used in
bags for food, fuel and poultry—
Folmet Packaging Engineering, 1747
Marden Ave., Oakley City, Calif.

Single pilot-operated hydraulic valves
for automatic control of hydraulic cir-
cuits in the sub-plastic type for panel
mounting, designed for full 9000 psi.
It is available in 1, 2, 3, 4 and 16 in.
valves. The new version in the heavy
construction duty type shock, vibration
and failure low power consumption—
Revere Lube & Grease, Inc., Brighton
15, Boston Mass.

Electrically-actuated float level indicator
for control or indication of levels of vari-
ous liquids, weighs 2.9 oz. F-6885 red
color has no exposed metal parts and
can be used with solvents, oils, acids
and other chemicals. The switch is en-
closed in a nylon vase and is actuated
by piezoelectric magnets embedded in the
float. Eighteen gage nylon insulated
leads extend through the threaded
mount—Hercules Corporation of Amer-
ica, Wallingford, Conn.

Self-sealed skat-off valve 4 1/2"
in. long, 2 1/2 in. wide and 3 1/2 in. high.
Available in tube sizes from 1/2 to 4 in.
The valve features low current draw
but when explosion-proof operating
range 0 to 1000 psi., temperature range
-65 to 275 F. also rated from 0 to 10
psi.—Mac Vain Engineering Co., 7470
W. 104 St., Los Angeles 45, Calif.

Drafting templates provide electronic
and electrical symbols. Made of color-
coated vinyl plastic, they are .015 in.
thick—E. F. Trench Co., Inc., 726
W. 10th St., Los Angeles, Calif.

Auto-Tune unit, a straight line type,
driving circuit, provides a standard
application to both automatic and semi-
automatic assembly operations. Avail-
able with 40 to 72 centers, 1 x 6 or
12 in. wide track, and wide color.

PIONEERING is our business



Type D-2A New Air Force Standard OXYGEN REGULATOR

Designed for better performance, longer life, easier maintenance

Meets all requirements of MIL-R-8202-B

Already in production

Operates with either mask or helmet
Interchangeable with D-2 type

Seawater-resistant pressure demand
unit, designed for the D-2A Type 2005
(D-2A) Automatic Demand Pressure
Demand Oxygen Regulator, oper-
ating the D-2A Type 2005 (D-2A) The
new D-2A is a more efficient performer in
every way—the direct result of careful
designing and development by the world's

most experienced experts in Oxygen
Regulation and Liquid Oxygen Carrier
Delivery. For full details, view pictures
INTERNAL FEATURES, DEMONSTRATION
OPERATIONS, MAINTENANCE, ETC.

West Engineering Corp., 1000 Broadway Ave., Newark,
Calif. • Export Sales and Service: British International
Division, 201 & 202 St. New York 10, N. Y.





*Shape of things that come— from TWIN COACH

Prop or jet...single or multi-engine...trainer...interceptor...turboprop or tanker transport—Twin Coach Aircraft Division is probably unique among America's great subcontractors in its ability to produce major assemblies for many different aircraft types.

That's because we're aircraft specialists. Twin Coach Aircraft

Division's five plants are devoted exclusively to production of airframe major assemblies. We build no other products...do no other work.

This is important because it means your airframe assemblies are built by experienced aircraft specialists...are tailor-made to fit perfectly to specification, on schedule, at the lowest possible cost.



TWIN COACH COMPANY
Aircraft Division
BUFFALO, N. Y.

Other divisions of Twin Coach Company make:
PROP DRIVEN TRUCKS • FUSAGE, CABLING AND ROCKET ENGINES
• FUSAGE, LIFTING FUEL SYSTEMS • JET-ENGINE AIRCRAFT ENGINES

Orwell Invert, a combination gunner-radar and slot-milling machine that can remove up to 150 sq. in. aluminum per minute, is just one of many hundreds of modern, high-speed machines, in use



vertical or horizontal machining carbides on the turret. Work centers attached to a double roller chain have ball bearings mounted in both horizontal and vertical planes, guided in tracks mounted on the chain frame. **Symco Tool & Machine Products Co.**, Englewood, Pa.

Attention! Not interested in a lot of expensive building material under "Speed-Chek" assemblies? These assemblies will stick tightly to any smooth, moisture surface such as porcelain, glass, plastic and metal as in painted surfaces and will not crack, peel, chip or scratch. **North Shore Nanoplast, Inc.**, 714-27 Northern Blvd., Borneo, N. Y.

Universal perforating units, known as "Unipunch," feature a six-piece punch and small barbs that which provide substantial reduction in the cost of replacement parts. Unit also features a measuring pilot pin, which is constructed with the combination of the punch and die. The pilot pin is a constant 1/8 in. diameter regardless of the size of the punch or die in whether the punch is round or shaped. **Punch Products Corp.**, 1800 Highland Ave., Niagara Falls, N. Y.

Automated lathe rotates steadily rev. light above the lathe, thus preventing the risk of increasing control involving direct lighting work support approach and vision lighting. Lathe can cut up to 120 in. apart and, in some cases, 150 in. as compared with 50-100 in. spacing. **Applied Tool Works, Inc.**, 100 W. 10th St., Minneapolis, Minn.

Scal-climber, water wash paint spray booth for production spraying large or elevated work chambers, in which results of paint routine is handled down and which contained. **M&F Manufacturing Co.**, 1771 Westing Ave., Indianapolis, Ind.

High speed turnplate making machine for small machines and dental castings. Model MS can put castor-ceramic seal machines as well as other changeable legends on two or more lines. **Exter Ltd.**, 100 W. 10th St., Minneapolis, Minn.

Control voltage welders available in 100, 750 and 1,200 amp, allow the operator to select the desired arc voltage, which means constant during the entire welding cycle. The constant voltage feature means uniform deposit, hot speed and travel with all manual controls. **Humboldt Corp.**, Milwaukee 40, Wis.

Here at



are the right answers to all your valve problems

Here under one roof at Clary is every facility to solve your fuel, hydraulic and pneumatic valve problems. Here are excellent design-engineering, manufacturing and inventory facilities... able to produce small valves or large valves... existing valves or brand-new ones... valves of every description for offshore and marine applications... From the small precision Arman valves shown below to complex proportional valves.

So when you think of valves, we hope you'll think of Clary. We'd like very much to be of service to you.



ARMAN High Pressure Bleed-Off Valve 1,000 psi. Self-sealing, spring and pressure-loaded closed. Bleeds safety, air, etc. from pneumatic and hydraulic systems under pressure.



ARMAN Air and Fluid Pressure Reducing Transmitters range in specification from... 40" to 4,000" P. Relief functions are independent of regulated flow. Pressure reduction between 0 and 100 psi. For such use as reservoirs, compressors, air-acting, make valve guide channels, penstocks and fluid control systems.



ARMAN Aircraft Double Valves Self-locking and self-sealing. All standard styles and sizes of valve and outlet fittings are provided for valve size and flow rates 1/2", 1/4" and 1/8". For use with all types of aviation basic technology. 25-4 plus other fluids such as alcohol, water, hydraulic fluid, ammonia, glycol.



AIRCRAFT DIVISION, Dept. 1000
CLARY CORPORATION, One General Lee Highway, Chevy Chase, Md.

**All business
is specialized**

*... and nothing
specializes*

*on your business
like your business paper*



You can tell instant action on Broadway or Beacon Street, but this ongoing information can tell a whole lot more... because he specializes.

Your business is specialized, too. That's why it pays to keep up with your business paper. It specializes on business problems you meet every day. It helps you do a whole lot of a lot better job by keeping you posted on your whole field. You can move ahead when you know what's ahead, you can make quicker, wiser decisions when you have a clear perspective on what's happening, and you get all this from your business paper.

Every page counts. The editors gather facts, weigh and interpret them. The advertisers line up new products,

materials and equipment... tell you what they do and where to buy them. To know what's new that's important to you, read every issue—thoroughly! It will keep you one of the best informed people in your field.

This business paper is your head has a plan for you, because it's a member of the Associated Business Publications. It's a paid circulation paper that must earn its readership by its quality.... And it's one of a leadership group of business papers that work together to add new values, new usefulness, new ways to make the time you give to your business paper still more profitable time.



A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW" booklet." Room 2710.

McGraw-Hill Publishing Company
212 West 42nd St., New York 36, N. Y.

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS



Engineering

Design

Research

Development

Birthspace for bright ideas?
2,568,000 square feet of it!



Creative engineering ideas need room to grow—like the 2,568,000 square feet of floor space maintained by Goodyear Aircraft Corporation at its Akron plant; the \$24,000,000 project at its Leitchfield Park, Arizona operations; the 181,000 square feet at its Wingfoot Lake, Ohio facility. Creative engineering needs modern tools and equipment—like the Goodyear-built computer laboratory, one of the largest and most modern in the world; like the new million-dollar engineering building now under way at Goodyear Aircraft, Akron; like the new electronic engineering build-

ing and laboratory now under construction at our Arizona plant.

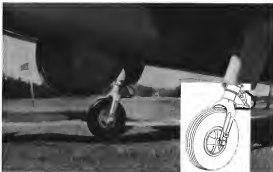
Creative engineers need scope and challenge to thrive—like the planning assignments now under way at Goodyear Aircraft in aviation, metallurgy, jets, electronics, airships, gliders, helicopters, radar, guidance, and countless aircraft components.

Send round, or for application form write: C. G. Jones, Personnel Department, Goodyear Aircraft Corporation, Akron 10, Ohio. Plants in Akron and Leitchfield Park, Arizona.

They're doing big things at
GOOD YEAR AIRCRAFT

THE TEAM TO TEAM WITH IN AERONAUTICS

Golf course fairway — *Seamew* runway



Whether on life or tough ground, and in gross, the *Seamew* can dig in as securely, and even better if to the landing speed and long run by track. The track can be easily changed in test trials.

Seamew — a tough, economical, all-weather submarine hunter. In adverse weather — submarine weather — the *Seamew* can be airborne after a short take-off from an emergency strip . . . can conduct a radar search and low-level attack . . . and can land back safely almost anywhere (even on a golf course!)—due to its slow approach speed and shock-resistant undercarriage.

The **Short** answer
is the **Seamew**



economy of manufacture is facilitated by economy of construction, in form of monocoque and open components.



The extremely good landing characteristics of the *Seamew* manifest with simplicity of construction and clear vision make it an excellent aircraft for pilots with little experience of this type.



TF-102A: Trainer-Interceptor

Convair's TF-102A trainer, with side-by-side seating, is the company's answer to the heavy problem of introducing a prospective interceptor pilot with flying and fighting a complex kind of a supersonic weapon system.

It also may be the company's answer to the criticism of the one-man all-weather fighter, because the trainer also can be flown as a full tactical weapon to reflect one or two men.

Length and contour of the original nose—which looks ample for a tandem cockpit—were changed drastically to make the side-by-side layout. The approach side to the cockpit that the modified version was designed from the start to serve as a two-man interceptor as well as a trainer.

From the cockpit sit, the trainer and the fighter are identical. Four fuselage lines sculptured by the new rule (AW Sept 12, p. 12). Forward section, although much better, is apparently biased to the cone principle of gradual area buildup. But the shortness of the nose means an "obedient shape" all lower, high-diameter ratio had to be chosen for the new control. Such a shape must have a higher drag, and therefore the trainer version—while still a supersonic airplane—must be somewhat slower than the normal fighter.



NOW IN PRODUCTION FOR THE ROYAL NAVY AND THE ROYAL AIR FORCE

Short Brothers & Horland Ltd., Queens Road, Belfast, N. Ireland. The first manufacturers of aircraft in the world

NOW YOU CAN GET BETTER COOLING!

COMPLETE LINE



Units for use on the operation have capacities from 50 to 250 cfm.

HIGHLY EFFICIENT



Design means efficiency translated to a compact "Parker" size.

LIGHTWEIGHT, COMPACT



High air displacement and pressure achieved with minimum weight.

Maximum flow is 175 cubic ft. per minute, pressure 10 in. Hg. at 1500 rpm.

new Persco axial flow blowers

More efficient air delivery on exhaust as possible with the new Axial Flow Blowers now manufactured by Persco Engineering, Inc. In addition, these advanced design blowers have been proved under tough service conditions. They provide better cooling, heating or ventilation for a wide variety of aircraft and industrial applications.

Persco® Axial Flow Blowers are self-

contained package units which serve space and permit more flexible product design. They incorporate a three direct coupled to a Persco Electric Motor for efficient air flow.

An outstanding characteristic of this new Persco product is the high capacities achieved with minimum power. Careful aerodynamic design achieves optimum efficiency with axial air flow. Persco Blowers withstand severe conditions of shock, temperature, pressure, altitude, humidity and duty cycle. Rated for con-

tinuous operation at high ambient temperatures, they perform in any position. Dynamic balancing ensures quiet, vibration-free operation. Flange or clip mounting is optional.

Before you proceed with the design or re-design of any equipment requiring localized heating or cooling, investigate the better performance now possible with Persco Axial Flow Blowers. For complete details, contact your local Persco representative or write: Persco, 2500 North Miles Road, Bedford, Ohio.



ERG-WARNER CORPORATION
34700 NORTH MILES ROAD • BEDFORD, OHIO

AVIATION SAFETY

CAB Accident Investigation Report

Shop Error Behind UAL Crash

THE ACCIDENT

A Cessna 140 N, 71154, owned and operated by United Air Lines, Inc., made a shop-type emergency landing on early morning of Dec. 15, 1955, at 10:15 A.M. of the 36 passenger jetliner in emergency, there was no injury to the crew of three. The accident was substantially delayed.

Flight 319 departed Des Moines on a VFR (Visual Flight Rules) flight plus at 10:05 in Omaha, Nebraska. The gross weight of the aircraft was 41,211 pounds, 1,415 pounds less than the allowable 42,626 pounds. According to company records, the fuel was properly distributed with respect to the center of gravity of the aircraft.

HISTORY OF THE FLIGHT

United Air Lines Flight 319 of January 19, 1955, originated at Newark, New Jersey, with its destination Omaha, Nebraska, with intermediate stops scheduled at Milwaukee, Minneapolis, Des Moines, Ames and Cleveland, Ohio. Chicago and Madison, Illinois; Iowa City and Des Moines, Iowa, and Omaha, Nebraska. It departed Newark at approximately 17:00 and was en route to Chicago.

In Chicago a customer name change was made. The new crew consisted of Captain Earl W. Anderson, First Officer Thomas B. Ryde and Stewardess Reed Peters.

After the flight, the aircraft was checked and was found to be in good condition.

Johns. The aircraft departed Chicago at 17:10, and the crew of the flight to Des Moines, Iowa, was made up of Captain Earl W. Anderson, First Officer Thomas B. Ryde and Stewardess Reed Peters.

Flight 319 departed Des Moines on a VFR (Visual Flight Rules) flight plus at 10:05 in Omaha, Nebraska. The gross weight of the aircraft was 41,211 pounds, 1,415 pounds less than the allowable 42,626 pounds. According to company records, the fuel was properly distributed with respect to the center of gravity of the aircraft.

The check to 5,000 feet was successful but at that altitude the crew noticed vibration and a slight loss of control of the aircraft. The check was made to 5,000 feet where the aircraft was level and power was reduced. As the vibration was still present at that time, the captain attempted to diagnose by engaging the autopilot. However, this was unsuccessful and the aircraft was subsequently crashed.

The first officer and stewardess both died, but it is believed that they were killed by the impact of the crash. The first officer was killed by the impact of the crash. The first officer was killed by the impact of the crash.

About the time a safety officer in the control system was left and it was with a time difficulty that an indication of the aircraft was maintained. The first officer was not leaving the flight, due to the 24-day period, but in the did not help in question control to return there in the 14-day period, where it was found the most desirable results were obtained. Accordingly the first officer was not leaving the flight, due to the 24-day period, but in the did not help in question control to return there in the 14-day period, where it was found the most desirable results were obtained.

The briefing, however, to return it was then necessary for the captain to help the captain hold the control system. However, the briefing, however, to return it was then necessary for the captain to help the captain hold the control system. However, the briefing, however, to return it was then necessary for the captain to help the captain hold the control system.

By that time, the aircraft had descended below 3,000 feet. Both officers were killed as a result of the crash. The aircraft was not in a position to be recovered. The aircraft was not in a position to be recovered. The aircraft was not in a position to be recovered.

During the flight, the captain noticed the engine and headed toward the

New AMERICAN Inertia Reel

MULTIDIRECTIONAL SHOULDER HARNESS TAKE-UP

MODEL 30



1. Light and compact—weighs 1.5 lbs.
2. Operates in 1/10" per inch
3. Operates with Specification 100-0-0214 Type III
4. Used to hold any and all aircraft seats
5. Used to hold any and all aircraft seats
6. Used to hold any and all aircraft seats
7. Used to hold any and all aircraft seats
8. Used to hold any and all aircraft seats
9. Used to hold any and all aircraft seats
10. Used to hold any and all aircraft seats

Original product of the Inertia Reel Company, Inc., 1000 N. 1st St., Des Moines, Iowa 50319. American Inertia Reel is fully protected by patent.

The aircraft will be recovered promptly.

MANUAL CONTROL

American Seating Company

1000 N. 1st St., Des Moines, Iowa 50319

AVIATION WEEK

Buyers' Guide

A MCGRAW-HILL PUBLICATION

**Brings A Unique,
Long-Needed Publishing Service
to the Aviation Industry**

November 18, 1985, an all-important, needed publishing service will be available to the aviation industry... AVIATION WEEK's Aviation BUYERS' GUIDE. The dramatic development of aviation over today's multi-billion dollar growth is reaching into all phases of manufacturing—demanding a constant flow of products and materials from tens of thousands of separate suppliers—has made a comprehensive, complete source book of suppliers and manufacturers a must for all segments of the industry. AVIATION WEEK's BUYERS' GUIDE serves this intelligence need with an information source of just 1000 suppliers, placed directly into the hands of some 55,000 key aviation engineers, management men, design and purchasing personnel—men who make up aviation's real buying audience—in the industry itself, in the Air Force, and throughout the Government.

The latest developments in military procurement will be covered in a special report. Included in the detailed information to be provided will be: Air Materiel Command-Air Research and Development Command buying priorities, personnel listings-by name, general interest entries, and Air-Industries listings of manufacturers of aerospace and allied products, international for maximum utility under a many-heads-up. Aircraft, Missiles, Avionics, Supporting Groups, Nuclear Power Systems, Airlines and Airports.

Indexing is set up to provide quick, easy reference to buyers for all products. In addition, advertisements and product listings will be keyed to each other for ready reference.



MISSILES

Airframe and components
Guidance systems, ground launching
Components

AIRCRAFT

Engine and components
Landing gear, Passenger
Equipment, Fuel equipment



SUPPORTING GROUPS: Data systems, computers, ground-based
office eq., Electrical, ground equipment, Engines, Avionics, In-
struments, Airlines including taxi, chemical, plastic, metal, etc.
Including including machine tools, optical flying controls, land-based



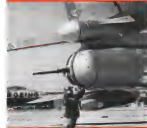
NUCLEAR POWER SYSTEMS

Accessories and components
Reactor controls
Reactor fabrication



AIRLINES AND AIRPORTS

Scheduled services, Non-scheduled
services, Cargo services,
Ground equipment, Lighting



AVIONICS: Communications system & equipment, Radio for civil
and military & equipment, Instrumentation and controls, Navigation
systems & equipment, Components and devices, Test equipment, Com-
puters & data processing equipment

Be sure you compare lists of products and services in listed in this basic book of buying information. Special discounts are offered for multiple and credit-type advertisements. Your AVIATION WEEK representative will gladly help you plan your advertising to make the most

commercial and statistical use of the GUIDE. Call for a copy.

* Average net paid circulation, 51,893 (June, 1985 ABC Statement). Paid circulation of current weekly issues more than 23,000. Current weekly price order exceeds \$7,000.

AVIATION WEEK

A MCGRAW-HILL PUBLICATION



ADEL

Pneumatic control valves

set new performance standards!

#23201
CHECK VALVE
1/2" & 3/4" size
Weight 0.45 lb.

#23202
SHUTTLE VALVE
1/2" size
Weight 200 lb.

#23203
ORING VALVE
1/2" size
Weight 1.00 lb.

ARL designed and manufactured to provide the best in control equipment where pneumatic systems are specified. Safe, dependable operation is assured with instantaneous reaction at working pressure up to 2000 psi. These production units have been thoroughly tested and are qualified to meet all applicable specifications.

ARL produces a complete line of AIRCRAFT ENGINEABLE & PNEUMATIC CONTROL EQUIPMENT; HEATER, AIRCRAFT & FUEL SYSTEM EQUIPMENT; ENGINE ACCESSORIES AND LINE SUPPORTS.

For complete engineering specifications and catalog

Address: ADEL DIVISION, GENERAL METALS CORPORATION
10775 Van Orsdel Street, Burbank, California



• SAFETY

center to let right. When the aircraft reached 500 feet above the ground the engine was accelerated as during the accident, and it struck the ground in a flat attitude. All occupants were quickly deployed as soon as the aircraft stopped.

INVESTIGATION

The aircraft came to a steep heading 195 degrees magnetic and in an upright position with its wheels arrested. It was in a level, unrecovered, attitude approximately on axis northeast of Heath Town.

From marks on the ground it was determined that the tips of the propeller blades and the struts attached to the bottom of the landing gear had contact with the ground. At this time the aircraft was approximately level laterally, and slightly nose high. The next ground contact was about 900 feet from the last marks found. At this point the aircraft struck the ground and bounced over a locked wire fence. It again struck the ground with great force about 190 feet further on, bounced another time, and landed in a slight right curve in its whole track 1,465 feet. Minor windings were traced along the path.

The underside of the fuselage was crushed upward and the top of the fuselage was badly damaged. All cabin and cockpit seats remained intact. Landing gear of the wings was distorted somewhat; the legs were extended about 15 degrees. All propeller blades were broken. Each engine was still attached to the airplane but these engines were severely damaged. The nose, which was normally free of its motor drive on the ground, considerably limited the damage the accident occurred during its take-off.

Because of the nature of the accident, attention was immediately directed to the engine and control system of the aircraft. The engine system was intact and virtually undamaged by ground impact. During the construction of the elevator torque tube assembly, it was observed that there was a vertical fracture of the right side. This completely disconnected the right elevator from the main torque tube assembly, and the pilot could no longer operate the elevator by means of the elevator control column. The left elevator was still attached to the torque tube assembly, however, and partial elevator control could still be obtained.

The left elevator assembly was found hanging in the full down (negative) position, with the rear terminal of the air push-pull tube attached to the rib bars.

Internal inspection of the servo tab assembly revealed that the push-pull tube had broken immediately ahead of the rear portion of its rear terminal. The rear portion of the broken tube showed evidence of abrasion over most of its entire surface, caused by its rapid and violent movement within the elevator. The internal surface of the elevator door in the rear of the tab push-pull rod was raised and distorted and the door was fractured in several places.

The inspection door was opened, and it was found that the servo tab after was completely detached from its support in the elevator. The 1 x 34 inch cross-sectional support bolt was fastened about one inch from the front end and the end of the bolt was found in the lower rear corner of the stabilizer 26 inches outboard of the

GYRON-SPECTRE

for the

MIXED-POWER-PLANT

FORMULA

The GYRON

a most powerful axial jet engine designed to a formula embracing all the features which are indispensable for supersonic flight.

The SPECTRE

a liquid-propellant rocket engine developing its maximum power at altitudes beyond the scope of air-breathing engines.



THE DE HAVILLAND ENGINE COMPANY LIMITED

LEAVESDEN AERODROME, HERTFORDSHIRE, ENGLAND

Checked
at
every
step...

LELAND airborne equipment is right!

Every piece of airborne electrical equipment that leaves the Leland plant is right and we know it's right! Because we've proved it at every stage of its development and manufacture.

Prototype models are tested for performance under extreme conditions of high and low-frequency vibration, shock, altitude, temperature, salt spray and humidity, scientifically checked for RF noise, dynamic behavior, proved in every possible way with the most modern, most accurate testing equipment.

And throughout production, every unit is subjected to this same kind of thorough, comprehensive testing to make absolutely certain that the unit you receive meets Leland's own highly critical standards.

These complete testing facilities and procedures give you still further assurance that Leland is capable of solving your aircraft electrical problem, whether it involves starters, alternators, generators, or brakes.

Why not get in touch with us.

Continued
Prototype assembly shop
confirms design as for testing
Altitude Chamber displays
dynamic behavior
Weather Test Chamber design
assembly line inspection
assembly check quality



THE LELAND ELECTRIC COMPANY
Division of American Machine & Foundry Company
Dayton 1, Ohio
In Canada: Leland Electric Canada, Ltd., Oshawa, Ontario

Write us now to see our all
EODIN &
AIRCRAFT ELECTRICAL
EQUIPMENT DISPLAY
Box 37-38
Pasadena
San Diego
Los Angeles

• SAFETY

After the mounting system of the after fire support bolt was found in place in the after with its fastened and built with the original line of the after, the broken and was broken. A lock, certified and two weeks of the after and type used with the support bolt was removed from a hole in the side balance curtain. No other part was found.

The large cracks on the side were two inches, indicating there had been a violent reaction of the bolt sending in considerable outward.

The elevator closing was not caused and deferred opened to action of the after bolt and not pushed out. The cause of the after bolt support bracket was severely bent and should not be removed from the support bolt locking.

It was determined that the accident was properly dispatched and that neither was a factor in the accident.

A study of the maintenance records disclosed that on January 18 and 19, 1955, the aircraft underwent a 1,500-hour inspection of the company's line maintenance here at Newark, New Jersey, and the inspection was carried out approximately five hours before the accident occurred.

To understand better the chain of events that occurred with respect to work performed on the aircraft, it was advisable to consult the list of personnel with respect to personnel at the Newark base, and then working hours. The base is headed by a chief manager, who has under him a chief mechanic supervisor of mechanical services (now chief), supervisor, test mechanics, and mechanics. There are three flight shifts daily beginning at 12 midnight, with personnel reporting for duty 90 minutes before each shift. Top supervisory personnel above the first shift level are a part of each shift or are available by telephone if needed.

The crew system used at the direction of work comprises a work control room, a control room and a maintenance job room. The work control room is a control room that has all the work to be performed. Routine job cards are distributed among the mechanics according to the number of work necessary to be turned for each individual inspection. Nonroutine job cards are made out and initiated by mechanics when they encounter such necessary to be done other than that specified on the routine job card.

N 7514 was in the shop under fire a 1,500-hour check at the start of the 1,000 a.m. 4:00 p.m. shift the morning of January 18. During the inspection of the engine room, which involved a detailed inspection of the fuel-injection system, electrical and control system components it was found that there was excessive play in the elevator after job. A non-routine job card was made out by the mechanics but no corrective action was taken because of the proximity of a shift change. The crew did not get all the broken and used that on the day following the repair of the after bolt was not taken into their view to mention A & E mechanic.

The after bolt was dismantled to determine the cause of the play and it was found that the after support bolt was completely worn. The mechanics left the bolt with the crew chief for maintenance and returned to his work. This particular type

UNIQUE SENSITIVE RELAY Incredibly small, lightweight and adjustable!

ADVANCE "SO" SERIES

Here for the first time is a sensitive relay only 1-7/32" x 3-4/8" x 1-1/4", weighing only 1-1/2 ounces, and adjustable over a wide range. You get much more latitude with this relay in designing for any area.

The Advance "SO" is set in the factory to operate on 10 milliwatts. User can adjust it down to 2 milliwatts, or any desired pick-up or drop-out, by means of ten screw contacts. A balanced network provides extremely sensitive operation. The unit is highly efficient, ruggedly built, and offers excellent shock and vibration-resistant characteristics.

Contact arrangements in SPDT. Coil resistances: 4000, 6100 and 10,000 ohms. Life expectancy: 250,000 operations. Available in open or closed, den signs or normally closed contacts. Now in quantity production, Advance "SO" relays are priced amazingly low. Write for literature.



Coil Resistance	Pick Up Voltage	Pick Up Current	Drop Out Voltage	Drop Out Current	Drop Out Adjustment Range	Resistance	Contact Drop
4000	6.4 V	1.6 MA	3.2 V	0.8 MA	192 V	.0015	002/003
6100	8.1 V	1.52 MA	3.9 V	0.9 MA	140 V	.0015	002/003
10,000	10 V	1 MA	5 V	0.5 MA	178 V	.0015	002/003

ADVANCE ELECTRIC AND RELAY CO.

AN 0208 NATIONAL SWITCH COMPANY AFFILIATE
2435 N. MADISON STREET, BURBANK, CALIF.



If Your
Government
Contract....

...or Your
Regular Product

Requires
MANUALS

Call in the
McGraw-Hill
Technical
Writing
Service

- OPERATION
- SERVICE
- OVERHAUL
- PARTS CATALOG
- TRAINING

Whether you need one or a set of extremely written and illustrated manuals to meet Government specifications or whether your products are such that instructions on their proper installation, operation, and service must be provided... Technical Writing Service is at the job for you effectively, efficiently, economically. Technical knowledge and writing skill are the backbone of our service.

Write or Phone

TECHNICAL WRITING SERVICE
McGraw-Hill Book Company, Inc.
333 West 42nd Street
New York 36, New York

Re: Dilemma 6-2080

SAFETY

belt was not to stick, and as emergency order was issued regarding that it be used immediately from the company's base at San Francisco. The emergency order was written up on the assembly job card.

The purchase later notified that the wire belt was returned to him by the lead assembler with the instruction to put it back in the other assembly booth (again tight). The wire belt was then replaced but not adjusted. No explanation was written on the assembly job card covering this emergency condition. This was contrary to the company's emergency instructions.

When the midnight shift came on duty there was a heavy workload and the new crew chief (who was the only one assigned on that shift—normally there are two) was not limited with respect to the wire belt.

The work on the night continued, in a normal manner and when completed, the supervisor notified that the subject was surface job and had not been signed off as completed. At this time, however, the machine assigned to the job reported to the supervisor that he could not find the customer's play in the wire belt assembly. Accordingly, an inspector was requested to check and determine if this was so. He returned in a short time and said that he could find none.

The supervisor then went to the job with the inspector and from the ground watched while the job was checked for five plus. Observed an inspector plus the supervisor noticed the machine error, asking the operator "OK for service."

ANALYSIS

Correction of known problems here with wire belt assembly indicates the following sequence of failure. The subject underlined error which follows the idea assembly report left in its broken back of broken of elevator. This position left the machine out of the outboard bracket.

With the latter reported only by the lead through the relevant bracket lines were traced which broke the lead line each time in lead. This allowed the idea to drop down and the error to begin to occur, causing a forward and rearward movement of the machine under the lead. Leads were then adjusted in the rear prob prob left causing it to fail. With the then movement to building, the belt assembly was also affected as it is, has oscillated about as large loss.

The resulting fault caused by the left and right elevators being out of phase. The right side torque tube connector plate, when taking the right support for the torque tube assembly had preventing output and of the right elevator. Without the right support, from dislocated the torque tube assembly forward about the left support, resulting in almost complete control of the left elevator from the control.

A thorough study of the company's line maintenance procedures, encompassing its record control system, was made during the investigation of the accident.

As a result of this study, and the testimony of the witnesses called at the public hearing, it was determined that the company's maintenance program and the detailed procedures set up to it were adequate.

In this instance, however, the procedures broke down because of the failure of the torque elevator. The system provided safe-

DOW CORNING
CORPORATION

Silicone News

FOR DESIGN ENGINEERS

Silicone Fluid Used to Obtain More Uniform Gage Response

While the viscosity of most fluids changes with temperature, Dow Corning 308 Fluids have relatively flat viscosity-temperature slopes. This characteristic gives them ready and consistent resistance to oxidation and mechanical shearing make these silicone fluids ideal for use in damping and hydraulic media in such devices as the many business pressure gages manufactured by Taylor Instrument Company.



Initially, the hydraulic system used to contain viscous liquids in pressure gages is, to the person and owner, a source of trouble. The fluid controls the dial indicator of the gage contained a glycerin and water solution. For the viscosity of the solution varied with changing temperature, thus causing the erroneous reading of the gage on very readings.

After an adjustable outlet installed in the hydraulic system failed to solve the difficulty, Taylor engineers replaced the troublesome water solution with a Dow Corning 308 Fluid. Showing very little change in viscosity at operating temperatures ranging from 10 to 180 F., the silicone fluid keeps the gages operating uniformly in any duty without further adjustments.

Taylor also uses two silicone compounds in the gages to assure accurate, dependable service. One of these materials applied to the piston and sector movement, dampens vibration and greatly lengthens gear life. Dow Corning 11 Compound is used on the drive wheel the facelike to prevent moisture from entering and freezing the gears.

Mc 47



Silicone Finish Protects and Keeps Die-Cast Range Ports White in Spite of Oven Heat

With prospective industry between those of repair parts and restoration specialists, silicone-based finishes maintain the appearance and prevent the rusting of attack, signs and signs of wear on the machine range. One of the early users of silicone-based finishes on repair parts, Professor State Co. of Cleveland, is now using them on its own parts and accessories. Here's the story of one of their recent applications.

The oven door of one of Professor's ranges is left ajar when the burner is in

operation. This is done to keep the temperature in the oven below the point at which the oven thermostat is set to turn off the heat. A defect in the thermostat alone does not work out and lead to prevent the plastic coating from being applied to the heat that passes through the slightly open oven door.

These brackets are placed while in reach the rest of the range. When conventional paints showed signs of early failure, Professor addressed a white silicone finish based on modified silicone resin and formulated by Glidden. This silicone finish shows no signs of cracking, peeling or lowering even after long exposure to oven heat.

This is the way the finish is applied. The die-cast parts are degreased and given a phosphate surface treatment to improve adhesion. After heating for 15 to 20 minutes at 375 F., the parts are sprayed with the silicone finish, heated 5 to 10. They are then baked for one hour at 375 F.

Mc 47

44 Silicone Grease Used In Juke Box

The effectiveness of most grease greases is greatly reduced by unusually high or low temperatures. This is why most companies, Dow Corning of Corvallis is the specialist in lubricants for the popular 44 juke box juke box produced by AMI Corporation of Grand Rapids.

Applied to the exposed moving parts of the record mechanism, this silicone-based lubricant maintains temperatures ranging from -40 to 250 F. against proper lubrication and trouble-free operation of installations in any climate.

Dow Corning 44 Silicone Grease has proved to be such an effective lubricant for this particular application that it has now become a standard practice for every AMI requirement to carry a tube in its regular repair kit.

Mc 47

Design Edition 13

DOW CORNING CORPORATION - Dept. DE-13-1

Material, Machine

Please send me ☐ I ☐ II ☐ III

NAME

ADDRESS

CITY STATE

ATLANTA • CHICAGO • CLEVELAND • ENGLIS • HENRY • LOS ANGELES • NEW YORK • WASHINGTON, D. C. Silver Spring, Md.
Gazette: Dow Corning Silicons 114, Toronto; Dow Corning Silicons 114, London; Pressure 21, Berlin, Paris



24-HOUR CLOCK

DIRECT READING, EYE-READABLE, SELF-STARTING

Printed position design. Two no. directly-rotated wheel, dual date. Second dial with C, A, K, color code. Indirect display. 115 vdc, 40 cps, 100 ohm.



Universal Model 10 (reversible) only 7 1/2" x 3 1/2" wide x 4 1/2" x 1 1/2" deep

2nd Model available for clock, table, or shelf use. Printed Model available for mounting in standard 10-inch rack.

Dual and dual Model available complete with tools in drawer, all control and push-button operation.

Write for Descriptive Literature

Milnes ENGINEERING AND CONSTRUCTION COMPANY
1270 STREET AND FIRST AVENUE, SUITE 100, NEW YORK, N.Y. 10003



Complete Up-to-Date Information on United States Airports

THE NEW 1955-56 AIRPORT DIRECTORY AND BUSINESS FLYER'S GUIDE

It's just off the press. It lists more than 6,000 airports... by exact location and longitude, weather and type of runway, light and landing, observation, radio and weather facilities, airport services, hangars, etc. Information—more than just facts. Among many other exclusive useful features are tips on weather and navigation, a map of all CAA airports, and data on varying state quarantine laws. A free United States Flying Chart goes with every copy.

The price is \$4.00 per copy. Send your check or money order to:

AIRPORT DIRECTORY McGRAW-HILL PUBLISHING CO.
120 W. 43rd St., New York 36, N.Y.

• SAFETY

grade, one of which required that an inspection of all work performed be written on the respective maintenance job card, noting that the outgoing crew chief at the top of the work shift level, in a work shift as necessary, the following crew chief receiving the work accomplished during the foregoing work period. These company procedures were not followed in this case.

When the final inspection for play in the same job was made, no measure was taken. It was believed in that, if the same support loads are ordered and be chosen based from its position when received, a signal that for play might result in some being found.

However, since the maintenance job and was written up for work to be done and was not signed by the mechanic to indicate that the work had been accomplished, it is to be feared that the inspector making the final inspection should have gone beyond the set and instructions and actually examined the screw-in system. If this had been done the mistake probably would have been discovered before the mechanic was told to close all support control doors.

The control system was the failure to write an explanation on the job card that the bolt had been removed and replaced only finger tight, pending the arrival of a new bolt.

As a result of this accident, the company has examined the number of bolts especially purchased and available.

The Board believes the case was not treated with an extremely hazardous situation and that it was not by employing the utmost judgment and skill that a disaster was avoided.

FINDINGS

On the basis of all credible evidence the Board finds that:

1. The crew, the aircraft, and the center were properly certified.
2. The aircraft was under its allowable gross weight and the load was distributed so that the center of gravity was within approved limits.
3. The aircraft was properly dispatched.
4. Weather was not a factor.
5. During a routine maintenance inspection of the aircraft no explanation was written on the maintenance job card that the bolt had been removed and replaced finger tight pending the arrival of a new bolt.
6. Final inspection of the screw-in system failed to detect its unsatisfactory condition and the result was reliance for service.

Whether broken or not, resulted in loss in the screw-in system, resulting in a sequence of structural failure that resulted in complete loss of control of the aircraft.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was a series of mistakes made by maintenance personnel during a scheduled inspection which resulted in the failure of the aircraft as an unsatisfactory condition and no check of complete loss of elevator control during flight.

By the Civil Aeronautics Board,
EDWARD E. KELLEY
CHIEF OF BOARD
JOHN LEE
CLARENCE GURNEY
HARVEY D. DENNETT

TALOS

■ MANAGER—FIELD INSTALLATION AND EVALUATION

—Operates and directs activities of a large group of evaluation engineers, involving system functions of computers, radars and fire control equipment. REER, 15 years' experience in development and evaluation of electronic equipment (5 years' technical evaluation of major missile guidance systems).

■ PROJECT LEADER—DATA PROCESSING

—Supervise project activities involving radar video processing equipment (analog and digital). REER, 10 to 15 years' experience in development and design of electronic equipment (5 years' project direction). Experience with communication equipment desirable.

■ PROJECT ENGINEER—Prepares comprehensive engineering reports by consultation with development engineers.

REER, 6 years' experience in design and evaluation of electronic equipment, plus several years in the preparation of engineering reports and manuals. Knowledge of radar fire control desirable.

■ PROJECT LEADER—FINE CONTROL

—Technically lead a fine control project. REER, 10 years' electronic experience, including design, development, organization and technical direction of major projects (5 years in the control, including tactical and control displays and human engineering). Radars and data acquisition experience desired.

■ PROJECT ENGINEER—ANALOG COMPUTER

—Assume project responsibility and technically direct major portions of a fine control analog computer project. REER, 10 years' experience in electronics, including design, development, organization and technical direction of major projects (4 years' experience in design and development of analog computers required).

■ SYSTEMS ENGINEER

—Experience in broad systems design and defense introduction of processes is essential. REER, 8 to 12 years' experience in electronics of radar and ground missile systems; 5 years in design and development of radar and electronic systems required.

Please send resume of your qualifications to:

Mr. John E. Wild, Employment Manager
Dept. E-35, Radio Corporation of America
30 East 42nd Street, New York 17, N.Y.



RADIO CORPORATION OF AMERICA



believe in luck?

Is it luck when a man reaches the top before he's forty?

Certainly...if it is considered lucky to have ability, plus the good sense to find a working environment which is right for that ability.

It is that kind of "luck" which has resulted in the development of new management methods that are being shared by one of the youngest management groups in the aircraft industry today.

You don't need a rabbit's foot to find out what is happening at Martin...and what it might mean for your future.

Write to J. M. Kalky, Dept. A-33, The Martin Company, Baltimore 2, Maryland.

MARTIN
BALTIMORE

ENGINEERS

PERMANENT
CREATIVE OPPORTUNITIES
FOR
ELECTRICAL
AND
MECHANICAL
ENGINEERS
AT

Bendix

Immediate openings for . . .

SENIOR COMPUTER ENGINEER

At least five years experience with analog computers with aerial applications. A degree in electrical engineering or math and physics required. Activity is in the field of aircraft and missile systems and related equipment. You will be with highly motivated, creative and talented engineers. The last working research facility includes an analog computer and jet engine simulation.

MAGNETIC AMPLIFIER SYSTEMS ENGINEER

Electrical engineer, supervisory capability as principal and development of magnetic amplifier circuit systems and associated design and testing, supervising other engineers and technicians.

COMPUTER ENGINEER

Graduate engineer thoroughly qualified in digital computer programming, capable of leading engineering and production personnel in their general personnel in preparation of code for computer applications. Set up new applications. Work with existing systems and record problems encountered in the use of digital systems and develop new data.

MISSILE PROPPELLANT ROCKET CONTROLS ENGINEER

Mastered or electrical engineer to supervise the research and development of liquid propellant rocket control systems design, component design, development and testing.

The salary of these positions will be commensurate with your ability and experience.

Send detailed resume (detail where you are presently employed, and salary requirements) to:

TECHNICAL EMPLOYMENT DEPARTMENT
BENDIX PRODUCTS DIVISION OF
BENDIX AVIATION CORPORATION

411 North Bendix Drive
South Bend, IN, Indiana
We guarantee you an immediate reply.

AVIATION WEEK, October 17, 1955

Attention! NON-CITIZEN ENGINEERS & DESIGNERS...

...now you can work at Republic Aviation Corporation through a liberal new arrangement made available to all engineers and designers experienced in the Aircraft and Guided Missiles fields.

If you have had 5 or more years experience in AERONAUTICAL ENGINEERING and DESIGN—engineering ops or more of the following areas, Republic may have an important position for you in:

AERODYNAMICS	WEIGHTS
DYNAMICS	ARMS & MISSILE DESIGN
FLIGHT TEST	PRELIMINARY DESIGN
THERMODYNAMICS	ELECTRONICS
FLUTTER & VIBRATIONS	CONTROLS
SYSTEMS	SYSTEMS

Today Republic's famous Thunderjets and Thunderbolts are in service throughout the free world. These planes, as well as the new RF-4H Thunderflash, form part of the striking wing of the air forces of the U. S. and other NATO countries. Soon to appear are the F-103 and F-105, while planes embodying advanced aerodynamics.

drawings are already in the mock-up and prototype stage. Still others are on Republic's drafting tables.

AND TO WORK FOR REPUBLIC IS TO LIVE ON LONG ISLAND! You'll enjoy living in the playground of the East Coast, with its fine suburban communities, modern highways, miles of beaches and many state parks.

RELOCATION EXPENSES PAID...LIBERAL BENEFITS. Republic refers you and your family of all (except women connected with moving to a new position on Long Island). The company also pays life, health and accident insurance—up to \$20,000—for you, plus hospital-surgical benefits for the whole family, and 45 the cost of your college and graduate studies.

If you wish to join the select group of Republic engineers, no matter where you are located now, write promptly, describing your experience and training in detail. A convenient interview can be arranged on your release.



Address:
Mr. R. L. Berke
Assistant Chief Engineer

REPUBLIC AVIATION

FARMINGDALE, LONG ISLAND, NEW YORK

AVIATION WEEK, October 17, 1955

Become a Flight Officer with United Air Lines



Now booklet tells you how

United Air Lines—the nation's fastest growing airline—offers you small career opportunities for Flight Officers.

To qualify, you must have a commercial pilot's license with 505 hours or more (no multi-engine time required), be U.S. citizen and a high school graduate between the ages of 25 and 35, be between 5'7" and 6'4" in height, and able to pass a flight physical without waiver. Applicants with C.A.A. certification rating or a flight engineer examination written portion passed will be accepted through age 35, with tests through 38. Successful applicants attend United's Flight Training Center at Denver and receive pay while training.

Booklet pay: you get \$165 a month and are guaranteed to fly, and then that too, plus pay increases at regular intervals.

United Air Lines offers security, too, as well as good pay and rapid advancement. You enjoy a broad company program, retirement, company plan and many other generous benefits.

To get a booklet giving you all the details about your career opportunities with United Air Lines, simply fill in the coupon and mail. Remember, even if you are not immediately available, United's continuing growth will ensure the need for qualified men like you or me. Get the booklet and plan your future now!

It is likely that if I received this booklet, I will be interested in becoming a Flight Officer with United Air Lines.

Please send me your booklet that tells me how I can become a Flight Officer with United Air Lines.

Name _____
Address _____
City _____ State _____

Co-Pilot Mechanic

Reserve & R. R. commercial grade engine and mechanical (D-15) mechanical repair work. Aircraft based on Cessna 441. In 1988, Aviation Week & Space News 40th Anniversary.

SUPERINTENDENT MACHINE SHOP

Chance Vought Aircraft has an opening for an experienced Machine Shop Superintendent to assume responsibility for the operational administration and supervision of the Machine Shop. He will be responsible for the maintenance of production schedules, adherence to quality and cost standards and the efficient use of equipment and personnel. This machine shop of 500 employees includes a wide variety of machine tools such as mills, lathe, grinders, lathes, lathes, grinders, boring and welding machines.

The man that we are seeking should have from six to fifteen years of experience, a considerable part of which should have been spent in aircraft or engine machine shops. He should be experienced in directing a machine shop handling a wide variety of items of a specialty machining nature involved with the problems of a relatively low volume of production. Personal expense-paid interviews will be arranged for qualified applicants submitting a resume to:

CHANCE VOUCHT AIRCRAFT CORPORATION
SUPERVISOR SALARY DIVISION
P.O. Box 3000
Dallas, Texas

LOCKHEED AIRCRAFT CORPORATION

Georgia Division
Has immediate openings for
FLIGHT TEST INSTRUMENTATION TECHNICIANS

Minimum 5 year aircraft experience required with experience in the use of one or more of the following:

1. Recording Oscillographs
2. Recording Potentiometers
3. Oscilloscopes
4. Telemetry Equipment
5. Instrument Repair
6. Strain Gauge Application

Write in complete confidence
Dept. FI-1517

LOCKHEED AIRCRAFT CORPORATION
761 Peachtree St., N.E.
Atlanta, Georgia

ENGINEERS work on JET VTO at RYAN

The development of the dual a/c (jet-propelled VTOL) airplane is one of the most exciting developments which will take place in the near future. Ryan Aircraft Corporation is seeking qualified individuals to join its team.

OPPORTUNITIES FOR:
Flight Test Engineers
Design Engineers
Systems Analysts
Engineering Designers
Aeronautical Engineers
The company is seeking individuals with a B.S. degree in Aeronautical Engineering or equivalent.

RYAN
AERONAUTICAL CORP.
See Group 12, Catalogue

SHOULD PILOTS AVAILABLE
See Page 12, Catalogue
PILOT EMPLOYMENT AGENCY
See Page 12, Catalogue

ENGINEERS and DESIGNERS NEEDED

for:

MISSILE GUIDANCE SYSTEMS

POWDER NAVIGATIONAL COMPUTERS

NEW CIVIL AVIATION PRODUCTS

JET AND TURBO-PROP ENGINE CONTROLS

AIRCRAFT PRE CONDITIONERS



ON CAREER OPPORTUNITIES IN

System Engineering and Analysis
Experimental Engineering
Development Engineering
Project Coordination

Design Engineering
Product Engineering
Product Evaluation
Field Engineering

AND WE ALSO NEED:

DESIGNERS • CHECKERS • LAYOUT MEN

Positions Are Permanent

Excellent Advancement Opportunities

Entry is fully treated confidentially and given immediate attention and personal reply

WRITE TODAY FOR EMPLOYMENT APPLICATION

Mr. Louis E. Burke
Superintendent of Employment

**AC SPARK PLUG DIVISION
THE ELECTRONICS DIVISION**

GENERAL MOTORS CORPORATION
Milwaukee 2, Wisconsin

ROCKET AIRCRAFT POWERPLANT CONTROLS ENGINEER

The 1st in a new series of rocket engines for the development of a new rocket engine.

To qualify, you must have 10 to 15 years of rocket engine experience. The most critical is in rocket engine design and development work in rocket engine design and development.

At least a B.S. degree in mechanical or electrical engineering. Degree must be in Mechanical, Electrical or Aeronautical Engineering.

The man selected will have immediate openings in the design, development, testing and production of rocket engines for the development of a new rocket engine.

Minimum salary and employment benefits. Good salary and excellent living conditions in pleasant office environment. Please send resume and references to: Employment Department.

PHATT & WHITNEY AIRCRAFT
DIVISION OF UNITED AIRCRAFT CORP.
P.O. Box 1000, Hartford, Conn.

LOCKHEED AIRCRAFT CORPORATION GEORGIA DIVISION

Has immediate openings for
MATERIALS & PROCESSES ENGINEERS

Minimum 5 years experience in aircraft or allied fields in fabrication, design and materials specifications preparation and revision. Engineering degree required. Work involves contacts with Engineering and Manufacturing personnel. Special consideration given to applicants with nuclear experience.

PRODUCTION DESIGN ENGINEERS

Minimum 10 years experience in aircraft or allied fields of design and fabrication of parts and equipment with emphasis on cost reduction. Work includes review and approval, for producibility, of project drawings and contacts with Manufacturing personnel on fabrication and assembly problems. Special consideration given to applicants with practical experience on nuclear projects.

Write in complete confidence
Dept. MP-1017
761 Peachtree St., N.E.
Atlanta, Georgia



RESEARCH PROJECTS in the SUPERSONIC AND HYPERSONIC RANGE

One of the nation's leading organizations in the field of aerodynamic research, the Cornell Aeronautical Laboratory, is currently engaged in extensive investigation of the problems associated with flight at supersonic and hypersonic speeds in large programs devoted, respectively, to become available to technically competent men in June or earlier.

Two openings are described below. If you are interested in acquiring new information about these specific assignments, or if you would like to express interest in the possibility of employment, we shall be pleased to hear from you.

STRUCTURAL PROBLEMS CAUSED BY AERODYNAMIC HEATING

A major problem in the design of vehicles that will travel at the very high speeds of hypersonic flight is the prediction of the thermal energy under the high heat loading conditions to which they will be subjected. Analytical and experimental research is underway at Cornell aimed at obtaining a better understanding of this "thermal factor" and the structural problems associated with it. Men are needed to help in the structural phase of this program will work closely with a group that is making major contributions to the state of available data on hypersonic flow. We have few such resources in the field of aerodynamics designed.

STRESS AND VIBRATION ANALYSIS

The Laboratory has recently developed and installed a new experimental apparatus for use in an analysis of structural problems. We are seeking strong engineers with good backgrounds in either stress or experimental stress analysis to help in this project.

**CORNELL AERONAUTICAL
LABORATORY, INC.**
BUFFALO 21, NEW YORK

ENGINEERS ROCKET ENGINE CAREERS all NORTH AMERICAN AVIATION

The leader in large liquid Rocket Engine Design, Development and Test

CAREERS in ROCKET ENGINE
DEVELOPMENT DESIGN & TEST
at the PROPULSION CENTER

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

ENGINEERS

OPPORTUNITIES IN DESIGN & DEVELOPMENT

SENIOR ENGINEERS in space system development, research, and design. Engineers with experience in design and development of systems for space systems, including space vehicles, launchers, and other related systems.

ELECTRONICS ENGINEERS to work on advanced systems development and design in navigation, guidance, and control of space vehicles. Engineers with experience in design and development of systems for space systems, including space vehicles, launchers, and other related systems.

DESIGN ENGINEERS for design and development of systems for space systems, including space vehicles, launchers, and other related systems. Engineers with experience in design and development of systems for space systems, including space vehicles, launchers, and other related systems.

ENGINEERS AIR DATA Development engineers in rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

DESIGN & DEVELOPMENT ENGINEERS
In rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation. Rocket engine design, development, test, and evaluation.

TECHNICAL REPRESENTATIVES

LEAR, INC. is expanding its 110 tech field service organization to meet the needs of its customers. We are seeking experienced technical representatives to sell our products and services.

Attractive salary, liberal expense allowance. Assignments may require travel to customer or distributor offices. Company assistance for relocation.

Qualifications include:

1. B. S. Degree or equivalent.
2. Knowledge of communications, electronics.
3. Sales, service experience.
4. Must be U. S. Citizen.

To apply send resume to:
Field Service Manager



LEAR, INC.
110 Main Ave., N. W.
Grand Rapids 2, Mich.

ENGINEERS

DESIGNERS

Investigate Opportunities at

ERCO DIVISION
ACF INDUSTRIES, INC.

DRAFTSMEN

ERCO

Engineers have built a record of continuous progress and growth for themselves and for the Company for a quarter of a century. Growth in physical plant, personnel, number and diversity of products and services.

Today

Our growth continues and we are constantly on the alert for new men to add their talents to that growth... bringing new solutions to complex problems.

You

work will be interesting and stimulating... it might include electronic design, mechanical design, electrical design, or a variety of specialized electronic devices.

You

can choose a home town a number of fine nearby residential areas convenient to both shopping centers and plant... and you can further your education at the nearby nearby University... you can enjoy outdoor living and in winter stay south of the culture adventures of the Florida Capital.

ERCO

Now needs Electronic Engineers (all levels with some previous experience available), Aerodynamicists, Analog Computer Engineers, Mechanical Design Engineers, and supporting personnel. Send resume or request for additional information to:

ERCO DIVISION
ACF INDUSTRIES, INC.
BIVERTON, MARYLAND

LOCKHEED AIRCRAFT CORPORATION GEORGIA DIVISION

Has openings in the following classifications:

FIELD SERVICE REPRESENTATIVE

An opportunity awaits you in Field Service if you are under 40 years of age with previous field service experience and are willing to travel. Please include a recent photograph with your resume.

SENIOR PRICE ESTIMATOR

Requires ability to read and visualize shop operations from blueprints and a working knowledge of accounting statistics and material procurement.

Write in complete confidence:

Dep: PS-1067
761 Peachtree St., N.E.
Atlanta, Georgia



To the one engineer in 100 who is planning to make a change:

HERE'S A FRANK PROPOSAL:

Proven ability in research,
advanced design and development
will be matched by the
opportunity at Fairchild
Engine Division.

Fairchild Engine Division is a
leader in jet engine and
conventional propulsion systems.

Here at Fairchild, Research
Specialists, Design Engineers,
Thermodynamicists, Compressor and
Turbine Designers, Development
and Staff Engineers are experiencing
the advantages of seeing their own
ideas realized in a new plant and
Gas Turbine Laboratory. Our
expanding programs are matched
by the newest and most modern
equipment and facilities required
for advanced engineering. Your
resume or track will receive
our immediate personal
attention and response.
Please contact:
Felix Garéser

FORMING LEAD DEPIECE CORPOTIVE
FAIRCHILD
Engine Division

ONE PAIR 1600 BLAINE, NEW YORK

ches, Buffalo 658, South-Jones &
Co., 1901 S. Rockwell St., Chicago 3,
IL. **Binocular punched tape control
system, hookups, Bureau Engineering
Co., 10 Commerce Road, Stamford,
Conn.**

**Installation, performance and main-
tenance of Deconate electronic con-
trol, Bulletin KCI, Deconate Div.,
Entire Manufacturing Co., Kenosha,
Wis.** **Aerial photographic equip-
ment, data sheets, Gordon Enterprises,
North Hollywood, Calif.** **Modern-
ized gap fence double crank press,
Bulletin 67C, Niagara Machine & Tool
Works, 451 Northland Ave., Buffalo
11, N. Y.**

**How spermatogenesis is solving
nuclear engine problems. Data Sheet
DEI 30A1 (lead determination) and
DEI 30M (amplifier meter), Beckman
Div., Beckman Instruments, Inc., Full-
erton, Calif.** **Aluminum tracks,
holder, Magnesium Company of Amer-
ica, Toledo Aluminum Div., East Chi-
cago, Ind.**

**Pressure, oxidation and supporting
valves, catalog, Union Div., W. L.
Moore Corp., 426 W. 14 St., New
York 1, N. Y.** **Self-aligning spherical
bearings and rod ends, catalog, Kilo
Brass Div., Delta Steel Products
Corp., 812 S. Flower St., Burbank,
Calif.** **Industrial Electrical Switches,
Catalog 81, Altra Switch, Div. of
Manufacturers-Haworth Regulator Co.,
Freeport, Ill.**

Publications Received

- **Aerospace in Tolls-In Cos. Laurence S.
Rosen-Pub. by Little, Brown & Co., 14
Avonue St., Boston 6, Mass. \$1.95, 150 pp.** An unusual account of the Yalta confer-
ence.
- **World Power—by Neville Dales and Ed-
ward Lamberty-Pub. by Longmans &
Green, Inc., 17 East 69th St., New York 16,
N. Y. \$4.75, 120 pp.** Revised edition of a
history of the evolution of lighted flight.
- **FRS Symposium (International) on Com-
bustion-Pub. by Combustion Institute on be-
half of the American Society of Mechanical Engineers
on the occasion of the 1964 Symposium on
Combustion Symposium-Pub. by the Insti-
tute of Chemical Engineers, 410 Park Ave.,
New York 22, N. Y. \$15.00 300 pp.** Out-
standing papers presented at the symposium
held in 1964 at the University of Penn-
sylvania.
- **The First Five Million Miles—by Byron
Morton-Pub. by Huges & Boschen, 40 East
17th St., New York 16, N. Y. \$5.75,
274 pp.** An airline captain tells the story
of his 50 years of flying.
- **An Introduction to the Theory of Aero-
dynamics—CALCIT, Aeronautical Institute, by
V. G. Tsyp-Pub. by John Wiley & Sons,
Inc., 605 Third Ave., New York 16, N. Y.
\$12.00, 496 pp.** Fundamental principles of
the theory of aerodynamics.



MLW-7139A is the standard for
Warren Wire's WW400... super-tough nylon
made to stand up under the terrific punishment
of both ultra-high and extremely low temperatures
experienced by jets, guided missiles and
fast-moving air liners.
Warren Wire's WW400 is the toughest,
most heat- and chemical-resistant low tension
synthetic cable. With its silver plated copper heart
protected by impervious Teflon® treated
glass and lead, **WW400** meets the rigid military
specification of **MLW-7139A**...
withstanding temperatures ranging from
the above +400°F to well below -85°F.
In addition, this superb cable is impervious
to all fuels, chemicals and solvents.

**TO COMPLETE YOUR CLASS B ISOLATION SYSTEM:
TEFLON COATED GLASS FIBERS AND YARN
• WARRIENE AND GLASSITE TEFLON LEAD WIRE
MADE TO MLW 14576A • TEFLON MAGNET WIRE**



WARREN WIRE COMPANY

Plant and Main Office: FOWLER, VERMONT
NEW YORK • STAMFORD • NEW HAVEN • BOSTON
PHILADELPHIA • CHICAGO • CINCINNATI • DETROIT • CLEVELAND
ST. LOUIS • ST. PAUL • LOS ANGELES • SAN FRANCISCO
HONOLULU • KANSAS CITY • MILWAUKEE • MINNEAPOLIS
PITTSBURGH • RICHMOND • TAMPA • WASHINGTON, D.C.
and Local Offices... Newark, New Jersey and Boulder, Colorado

*Wire and Cable

(Circle 1)

SALES AND SPECIFICATIONS: Ask FOWLER, COMPOSITE and Golded
36-page Brochures with many samples and detailed
information on how WW400 fits your specific needs.

WHAT'S NEW IN TEXAS?



FORT WORTH ★ DALLAS

New plant for MENASCO

Expanded facilities for meeting the challenge of consistently better LANDING GEAR AND GUIDED MISSILE COMPONENTS

Pictured above is the new \$5,000,000 Texas plant of Menasco Manufacturing Company, scheduled for completion early in 1956. Centrally located between Fort Worth and Dallas, about two miles from Amon Carter Field, the initial 100,000-square-foot structure will house 500 employees and a completely integrated manufacturing system for the design and production of aircraft landing gear and guided missile components. The 42-acre site will allow further facility expansion, as required, to meet Menasco's growing production demands. Like Menasco's Baddeck, California, facility, the new plant will offer the benefits of the team of aviation experience, the highest engineering skills, and integrated manufacturing techniques that have always characterized Menasco's services to the nation's leading aerospace manufacturers.

Specialists in aircraft landing gear

menasco manufacturing company

871 S. SAN FERNANDO BOULEVARD, BURBANK, CALIFORNIA



AIR TRANSPORT

Slim Profit Margins Plague Airlines

Sir William Hibberd tells IATA meeting of traffic growth, increases in costs, postal rate problems.

By Craig Lewis

New York—Traffic on the international air transport system is growing at a healthy rate, but small operating profits are still a major airline worry, Sir William P. Hibberd, Director General of the International Air Transport Association, told here today.

Reporting to the Tenth Anniversary General Meeting of IATA, Sir William said that, while traffic showed substantial increases in all categories, the IATA members' operating margins were about 3%. Operating profit for all the world scheduled airlines was about \$71,000,000 last year—the best it has attained since 1952.

In his report, Sir William criticized world postal administrations for cutting services by forcing the airlines to accept rate cuts up to 30%, then failing to pass the savings on to the public.

The IATA Director General forecast continued gains in passenger and cargo traffic, with passenger development tied to penetration of tourist operations.

Capacity Gains 15%

Last year, IATA airlines flew more than 1.25 billion air-miles and carried 56 million passengers over 315 billion passenger-miles. Cargo tonnage was 652 million net tons, and traffic 104 million ton-miles. These figures show increases of 14% in passenger traffic, 75% in cargo and 10% in mail. At the end of 1954, the world's airlines were operating about 3,500 aircraft, 1,100 four-engines and 1,400 two-engines.

The overall total increased by 15 aircraft, but the four-engine total increased 100 planes. The result was a 14% increase in operating seats and a 17% increase in capacity.

IATA reports report that two-mile cost is generally downward, the result of two opposite trends. "While costs continue to rise, capacity increases in revenue, and the cost can be spread over a larger base. Sir William calls this but one 'precaution' since some costs such as fuel and other are limits to efficiency improvements."

This precaution balances new contracts for a few years of traffic gains are maintained and no unforeseen demands are made on the airlines, according to the Director General.

Sir William points out that the industry has to live on expansion, and that capital expenditures on long-haul aircraft now \$200 million last year. He predicts that the same amount will be spent this year.

Narrow Margins

With such expenses, the airlines can muster net operating margins of only 3%—\$71 million. Sir William compares this profit of world airlines with the 567 million profit of U. S. domestic airlines and reports an operating profit of 54 million for international airlines in 1954.

In his forecast, Sir William said that the airlines are handicapped in their development by having to work with narrow margins and by requiring subsidies. These factors limit airline freedom as business enterprises to handle their development. As costs are kept down, the fare level is also kept down, according to Sir William, because "A man must have bread even if you double the price of the loaf. It is not so with air travel, and we allow for that at all times."

The Director General described last year's operations as the last in the future of passenger traffic. He said this has been "unacceptably dissatisfied" on the North Atlantic where traffic has increased "by leaps and bounds" since biplane service was introduced. Of last year's 350,000 North Atlantic passengers, 75% flew round, and that was 36,000 more than in previous years. The total of all passengers in 1955.

Cargo Education

"Unfortunately," said Sir William, "the correct education of these people would have involved had tourist agencies not been available, but since it is our task to bring or travel to someone who we should, we should not concentrate on the question of direction and look instead at the overall financial results."

"By those standards the results are good, and there is no doubt that passenger revenue is generally much higher than it would have been had no tourist services been introduced," he said.

The development of air cargo is viewed by Sir William as largely a case of providing a simple, common-sense rule: schedule and then educating the ship-



SIR WILLIAM P. HIBBERD

ping public to the many advantages of shipping by air. He said the carriers expect to tap a mass cargo market as soon as they can make these profits.

The prospect for advances in mail revenues was not good, according to the report. The airlines have been forced to accept substantial rate cuts, and mail volume hasn't developed sufficiently to make up the difference. Sir William points out that while the volume of foreign mail carried by U. S. flag carriers increased 15% in 1954, foreign mail revenues declined 14%.

Postal Rate Problems

He also expressed disappointment that the postal administrations of the various nations have generally failed to pass savings from airline rate cuts along to the public in the form of reduced postal rates. It was hoped that such reductions would increase air mail traffic, he said.

For William called for a firm stand by the airlines against any attempt to further reduce rates at the 1955 Postal Congress at Ottawa. He said airlines are asking for a far deal, but they should try to get it and, in public sessions, are unable to do anything about it. If the governments concerned reject a postal profit and an airline failure, there is a risk the carriers can do about it, he said.

"If, however, governments are prepared to do an accurate assessment of the economic cost of each order of their carriers, they might give the carrier study at the highest level in order to maintain a better balance between the needs of the public and interests of postal authorities—bearing in mind that



Trans-Canada and Capital report remarkable traffic increases with Vickers VISCOUNTS

Wherever the Viscount flies...traffic figures rise! The latest dramatic proof of this statement is to be found in the recent records of Trans-Canada Air Lines and Capital Airlines.

TCA put Viscounts into service last April and increased traffic 22 1/2% over a major route in a five-month period. Capital inaugurated Viscount service on its Washington-Chicago route in July. Already they report that the Viscount is carrying more passengers in both directions than any other aircraft.

The preference air travelers everywhere show for the Viscount is securely rooted in advantages they can see, feel and enjoy. The Viscount has reduced flight times by as much as 20%. It is almost completely free from engine noise and vibration providing an atmosphere of unique quiet and comfort.

The turbo-prop Vickers Viscount has proved its

mettle under a wide variety of operating conditions. The results are always the same—profit, traffic and load factors up, operating costs down.

Beyond the Viscount stand the great name and service organization of the Vickers Group—internationally famous as makers of aircraft, ships, industrial machinery and precision equipment.



VICKERS-ARMSTRONGS (AIRCRAFT) LTD., Windsor, England

United States Representative: Glenday Clark, 12 Rockefeller Plaza, New York 20, N. Y.

It is, after all, the interest of their public, their taxpayers, which they should try to protect," Sir William said.

In reference to the relationship between governments and airlines and costs, the Director General observed that practically every time a government flies an aircraft in the airline business in general, the result is enormous costs or reduced revenues. Government as a customer and requirements for fares and information, and government taking over with the IATA rate structure inevitably result in dampen and in increased costs to the airline, he said.

Subsidy and Supervision

So William told the delegates he would like to see subsidy regarded and discarded with a better sense of proportion. He pointed out that many other industries are subsidized by their governments to a greater extent than the airlines. The subsidy for American international operations for the current fiscal year is quoted by Sir William at \$50 million, a third of the amount Americans are spending for coast-to-coast and two-thirds of the U.S. government expenditure in 1954 for postal plus airports. France spends less to support air transport than the \$60 million as used annually for the growing oil budget.

Airlines not only get government aid but are subject to "the onerous of laws upon laws of government export," Sir William said. He pointed out that airline practices are closely watched and regulated, and that such supervision is not conducive to the same development of an industry.

"Unjustifiably, the close regulation and scrutiny to which the airline is subjected does not produce among its scrutineers a recognition of what the industry really needs," he told the meeting.

The saving, too, toward unit charges for airports and navigational facilities was criticized by the Director General in his report. He said that there is already too much preoccupation with the costs and revenues of airports and too little concern with the benefit they bring to the community.

Navigational Needs

Since it became apparent that the airlines are not in due financial shape, most governments have moved toward a policy of charging for the use of navigational facilities, according to Sir William. International Civil Aviation Organization is preparing a study on navigational facilities, having not considered use of airport charges.

The airlines realize there are certain facilities, such as communication facilities with commercial application, which they should pay for, according to Sir William. But the carriers also believe

that the provision of facilities for safety and regularity of flight is an essential public service to be paid for out of public funds, he said.

Sir William also pointed out that a new class of larger, faster aircraft will be flying in a few years and considerable effort must be applied in providing adequate navigational facilities to handle such operations.

The Director General outlined a number of factors he feels are essential for the healthy development of airlines and a satisfactory relationship between airlines and government.

So William said the airlines would like to have the government take a less watchful and arbitrary approach to

their needs. They would like to have their problems better understood and be treated as a responsible industry capable of administering its position and planning its development.

The airlines would also like to have equal treatment with other forms of transportation, to have the same kind of regulation and follow the same commercial principles as the railroads and steamship lines.

The airlines would like to be considered as part of the community and a contribution to community development, and they would like to receive subsidies when they are necessary to support uneconomical public services, Sir William concluded.

International First Class Fares Increased 10% on Major Routes

A fare increase of 10% for some international first class services has been agreed upon by the International Air Transport Association. There is no change, however, in the basic international air fares.

The new rate schedules were worked out by the IATA Traffic Conference in a three-week session at Miami Beach, Fla.

Subject to approval by about 40 nations, they will become effective April 1, 1956.

Other changes made at the IATA meeting include:

- Slight increases in general air rates rates in some areas.

- An extension of the recently simplified rates into routes on the North Atlantic route through 1956.

- Extending the family fare plan on the North Atlantic, which starts Nov. 1, through the winter of 1956-57.

- Abolishing the open jaw discount, a procedure that permits a passenger to see a different fare for the return on a round-trip flight.

Under the terms of the agreement:

New Atlantic Fare

A 40% reduction in international tourist fares has been proposed by Pan American World Airways and Trans World Airlines for U.S. airlines present at the meeting. The new fare can apply on only travel from Europe to the U.S. and return, and only for members of the travel bureau on budget, traveling at this low expense.

An example of the proposed rates is a round-trip fare of \$194.00 between Frankfurt, Germany, and New York compared to the current one-way round trip fare of \$209.00.

There will be a 2% increase in first class fares between Europe and India and over Pacific routes and a 10% increase elsewhere with the exception of North and South America as well as routes from Australia to South Africa, Tokyo and New Zealand.

The key international fare between New York and London will become \$744 one-way and \$792 for round trip during the six-month and \$742 round trip off-season for first class. Sleeper exchanges for berth accommodation on all first class services will also be increased 10% to \$35.

A 10% increase proposed in tourist fares is an additional \$10 on the mid-Atlantic route between Central and South America and Europe. At the same time, this wide range of reduced fares for rail services will be maintained inside Europe while in the Middle East the number and extent of "B" class fares will be increased.

A wider distinction between tourist services and first class with additional "luxury" demanded the decision to raise international first class fares. Hugh B. Mann, chairman of the IATA Conference, said, "While we have succeeded in holding the price low for basic transport service on tourist aircraft, we have had to increase the charge for first class service in order to meet the demands of those passengers who want more luxury and also who are willing to pay for it." He added, "It is a source of concern to produce, we've got to charge more for it."

An example cited for improving first class service is the substitution of sleepers for the usual tourist train. However, such an arrangement reduces the number of passenger accommodations on many aircraft types by as much as one-third.

IATA based on acceptable standard



AERIAL AID TO AGRICULTURE

Save time and money with the Fletcher FU-24 UTILITY.

The C.A.A. approved UTILITY is designed for agricultural use. One hundred FU-24's sold in New Zealand operations have proved their ability to do agricultural jobs better and faster.

Attractive insurance rates enable you to finance this aircraft through conventional banking channels.

FLETCHER
aviation corporation
Fletcher Airport, Rosemead, Calif.

ATTENTION ENGINEERS—Fletcher Aviation has openings offering unusual opportunity to qualified personnel.

Check These Specifications... (They Tell the Story!)

Maximum Speed	More than 125 MPH
Cruising Speed	More than 100 MPH
Range	407 miles
Rate of climb at sea level	
at Gross Weight	410 fpm
Take off (1000' and 6000')	
Sea level over 50-foot obstacle	870 feet
Rate of climb	30 MPH
Maximum Speed at Gross Weight	
1500 lbs	56 MPH
1700 lbs	68 MPH
Useful Load	1400 lbs.
Gross Weight	3400 lbs.
Dimensions	
Wing Span	42'0"
Overall Length	31'0"
	7'4"
C.A.A. Part 2	

levels for local seat accommodations that will fill all the vacuum of starting and prospective assets. As a result, the conference was forced to agree upon stimulating measures starting during for 29 different aircraft types.

Responses to the subcommittee of present air cargo rates is an approximate 5% increase on the South Atlantic route, mostly between Europe and the Middle and Far East (including Australia and New Zealand) and (airborne only) from Europe to Africa.

A number of IATA study groups were appointed at the conference to report on these subjects:

- Expanding air cargo
- New potential measures to increase off-peak passenger traffic over the North Atlantic
- Integration of helicopter services into the existing commercial network
- Simplification of fares and regulations
- Remedies for the problem of "run shivers" and late connections

One phase of the subcommittee program which was adopted by IATA at Miami Beach is a new operations interface message procedure. The system is called AIRIMP and was jointly developed by IATA and the U. S. Air Traffic Conference. AIRIMP offers a uniform system of abbreviations and sequence of elements in transmissions designed to cut down to a 5% word reduction to a series of seven short abbreviations. AIRIMP gets its words only 50 abbreviations compared with the old system that required 540.

TWA Helicopter Plan

Trans World Airlines last week announced that it will offer helicopter transfer service between the three major New York airports beginning Nov. 1 for passengers arriving for and departing from trans-Atlantic flights.

The draft service, which is subject to Civil Aeronautics Board approval, was provided for in an arrangement between TWA and New York Aeronautics and is similar to a previously announced plan by Pan American Airways (AW Oct. 10, p. 113). The airline will also continue to provide ground transfer services between the airports—New York International, La Guardia and Newark—for its trans-Atlantic passengers.

New MATS Contract

Tuscon Airways has received a contract from the Military Air Transport Service for a number of military flights between the West Coast and Japan. The westbound flights will carry cargo and the return flights will be divided between passenger and cargo movements.

CAB Reduces Subsidy Estimates For Second Time in Eight Months

Washington—For the second time in less than a year, the Civil Aeronautics Board has surveyed the airline subsidy situation and made sharp reductions in subsidy estimates.

In reports issued in February and September, CAB estimated that the airlines will get less subsidy and less total aid per cent and future periods. The reports also revealed several airlines operations which no longer require subsidy.

In the latest report, subsidy needs for fiscal 1955 and 1957 are set at \$48.3 million. This is a 13% cut from the fiscal 1954 and 1956 under the fiscal 1955 subsidy.

The new estimate is \$8 million less than Congress appropriated for airline subsidy last year. Most of the reduction in the estimate was made in the international operations.

Two trunk carriers—Boeing Airlines and Continental Air Lines—are all subsidy for the last time this year, although Continental continues to support for the local service routes it took over when it acquired Pioneer Air Lines this year. Colonial Airlines and Northwest Airlines remain in subsidy.

In the international area, trans-Pacific operations at Pan American World Airways and Northwest Airlines are subsidy free for the first time. Trans World Airlines has operated without subsidy on trans-Atlantic routes since 1953, and Pan American closed 52.5 million in trans-Atlantic operations not comparable with TWA's.

In Latin American operations, Pan American, Boeing, Panagra and Caribbean Airlines will require subsidy, although the amount is substantially reduced.

	CAB Subsidy Estimates	
	Fiscal 1955	Fiscal 1957
	(\$000,000)	
Domestic routes	\$2,895	\$2,187
Local service	14,085	14,866
International	2,824	2,869
State Airlines		
operations	1,341	1,325
Inter Alaska		
operations	1,725	1,674
Transcon operations	299	281
Trans-Alaska		
operations	1,414	1,294
Latin American		
operations	9,511	9,562
Total	\$48,719	\$48,966

Subsidy requirements for local service and helicopter operations remain stable at \$24 million and \$2.8 million respectively.

Operations between the United States and Alaska are reported to require about \$5.8 million and trans-Alaska operations \$3.7 million.

The figures quoted by CAB are for 1955, assuming that some of the airlines covered in the report are still in liquidation.

- CAB Chairman Ross Ruffer attributed the reduction to seven factors:
- High level of economic activity
- Expansion of air transportation activity, particularly the sharp increase in low-cost service between both domestically and on a worldwide basis
- Air transportation is a good buy for the consumer's dollar
- Excess capacity and dependability record of the airline industry
- Increased volume of military mail moving by commercial air carrier
- Effect of these factors on the national economic condition of the airline and reduction of such expenditures in rate of the Board.
- Increased efficiency of the airlines

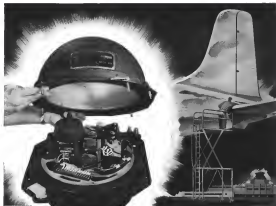
SHORTLINES

Boeing International Airways is purchasing an electronic navigation system that will keep track of seats on all flights 31 days in advance and automatically notify the airlines sales agent of seat availability.

Mohawk Airlines has purchased its fourth Convair 440 from Northwest Airlines. The addition brings the present Mohawk DC-3 and Convair fleet to 15 aircraft.

North Central Airlines passenger loadings during September revealed by 99% the loadings for the same month in 1954. The airline carried 45,515 revenue passengers in September 1955.

Severn Air Services, Inc., Cat Creek, Mont., has been licensed by the Canadian Air Transport Board to operate a non-scheduled air charter service to Trinidad, Winnipeg, Moose Jaw, Prince Albert, Regina, Saskatoon, Calgary, Edmonton, Lethbridge, Medicine Hat and Vancouver, Canada. The aircraft to be used over the routes are restricted to payloads of less than 6,000 lb.



UNNECESSARY INSPECTIONS WASTE YOUR MONEY

General Mills Flight Recorder tells when phase checks are called for

Here's an inexpensive, lightweight device that lets you safely record the period between structural inspection of your aircraft. Any variation from normal flight conditions—unusual turbulence, side, excessively hard landings—are accurately recorded by the General Mills Flight Recorder. With it, your crew chief can determine instantly whether an inspection is necessary, all costly groundwork is eliminated. In addition, the Recorder supplies structural information of value in checking your operational and safety standards.

The Recorder is a compact, sturdy instrument with no electronic circuitry. It is simple to maintain and offers insured repeatability. Let it save you money by keeping your planes in the air during revenue... instead of undergoing needless inspections!

CHECK THESE FEATURES OF THE GENERAL MILLS FLIGHT RECORDER

- Records altitude, speed, vertical acceleration and direction of flight. □ The flight recorder is protected in stainless steel by a half inch, shock up to 100 G's. □ Weight is about half that of other commercial recorders recording the same functions. □ Recorder consumes no power for 10 minutes following power failure. □ No circuitry—provides reliable results with a minimum of maintenance. □ Recorder is constructed of stainless steel—no direct, potential record that requires no photographic processing or computer playback. □ No special remote sensing package required.

Full Details on the General Mills Flight Recorder will be gladly sent on request. Write, wire or please! Sales Dept., Mechanical Division of General Mills, 16200 Central Avenue, Minneapolis 13, Minn. 55427-2-5811.

MECHANICAL DIVISION of General Mills, Inc.

Flying Tigers to Abandon DC-6s Upon Lockheed 1049H Delivery

Los Angeles—Flying Tiger, Inc., will dispose of its entire Douglas DC-6 and DC-4 fleet when it takes delivery of ten Lockheed 1049H Super Constellation airplanes in 1957.

This was announced last week by president Robert Prescott when he outlined the modernization program under which the air freight firm plans to replace its 520-airplane fleet. In a speech before the Aviation Writers' Association, Prescott said his firm will dispose of its present aircraft on this schedule:

- The company will trade five DC-4s, now leased to Northwest Airlines, to Lockheed Aircraft Corp. for \$750,000, 55 of which will be used to part off a bank lease and the other 52 will be sold for financing of the Super Constellation.

- Before June 15, 1956, the firm will sell the three DC-6s it is now operating. These will be sold for delivery to the bus or about March 1, 1957, along with delivery dates on the Constellation.

"The market indicates we can expect about \$4 million, all of which will be applied to the new-fleet program," Prescott said.

- The six Flying Tiger DC-4s will be sold to the most use on the DC-6s and are expected to bring about \$750,000.
- The company expects to derive \$500,000 from sale of its six DC-4s.

"The net effect of these phase dispositions is to increase our fleet from approximately \$7 million to \$104 million," Prescott said. "In addition we have 524-airplane in outstanding orders which are subordinate to bank borrowings on new equipment."

This will give the Tigers an effective net worth of \$13 million smaller as its borrowing power from the banks is concerned, the president said. "If conditions so warrant it, we will sell additional equity securities. We will be borrowing between \$12 and \$14 million from the banks for this."

Prescott pointed out that such a program not only will finance the Super Constellation purchases but also dispose of obsolete equipment. It will save the air freight firm with only two types of aircraft to maintain, the Super Constellation and the C-46, while the company will continue to use as a feeder.

Prescott said one of the expected benefits is closing the Super Constellation freighter with the delivery date. "We will get the planes starting early in 1957, a year before we could receive any other equipment," he said. "As you

know, that is highly important to us. One of the very real problems of a new company such as ours is on a field that already has established competitors is the time lag between adding and getting equipment."

Aircraft leasing factor was the aircraft fleet.

"We like the airplane," Prescott said. "It will carry nearly one-half more than the DC-6A and it will be 10% cheaper. On our (unannounced) schedule, we estimate it will cut two hours from our coast-to-coast operation. It will be slower because of its ability to do larger loads faster, thus enabling us to give better service and, therefore, generating additional traffic from high freight potential areas."

The new Super Constellation. The DC-6A has a productivity of 4,000 ton-miles an hour twice the last, 16 tons. The new two-and-one-half ton productivity of the C-54. The Super Constellation will have a productivity of about 7,000 ton-miles an hour. Thus one 1049H will do the work of more than three C-54s or one and one-half that of the DC-6A.

The said for this type of aircraft has been demonstrated in the airplane at the new Flying Tiger direct New York-Los Angeles service. This schedule means higher from New York to Los Angeles in 11 hours with no stops, including freight stops and only one refueling stop.

"It is too soon yet to accurately gauge the results," Prescott said. "But the fact that our operation has been profitable is encouraging. We have been operating with nearly 100% load factors in both directions."

During August and September, he said, the airline operated at the highest level of aircraft carriage air freight traffic in its history.

CAB ORDERS

(Sept 29-Oct 5)

GRANTED

Flying Tiger Line has a variation to put two Super Constellation 1049Hs, one in Houston, Texas, and one in a contract with the California Airlines Shipping Co., Northern Airlines' base, to operate in the North Central Airlines' Houston-Citrus County route.

United Air Lines' permission to use Chicago through D-House Airport, pending O'Hare and Midway Airport are not used on the same flight. Lines to Missouri in the East Detroit service are in City of Oakland, Cal., Air-

line Companies and the Southern, Mich., Chapter of Commerce. Indiana of County of Chicago, N. Y., City of El Paso, N. Y., City of Sacramento, N. Y., Arizona Companies, Lancaster, Pa., Airport Authority, City of Oklahoma, N. Y., City of Worcester, Mass., and the Zanesville, Ohio Airport Commission are denied.

Two American World Airways' permission to conduct air transportation of Alaska, American Airlines from New York to Alaska via the Alaska Airlines' route to Carlin Island, for one year.

Delta Air Lines' permission to use Chicago through O'Hare Airport, pending O'Hare and Midway Airport are not used on the same flight.

Flying Tiger Line has a variation to put two Super Constellation 1049Hs, one in Houston, Texas, and one in a contract with the California Airlines' Houston-Citrus County route.

Lines to Missouri in the East Detroit service are in City of Oakland, Cal., Air-

line Companies and the Southern, Mich., Chapter of Commerce. Indiana of County of Chicago, N. Y., City of El Paso, N. Y., City of Sacramento, N. Y., Arizona Companies, Lancaster, Pa., Airport Authority, City of Oklahoma, N. Y., City of Worcester, Mass., and the Zanesville, Ohio Airport Commission are denied.

Two American World Airways' permission to conduct air transportation of Alaska, American Airlines from New York to Alaska via the Alaska Airlines' route to Carlin Island, for one year.

Agreements between Trans World Airlines, Los Angeles Airlines and various other carriers relating to inter-airline agreements. Resolutions between various carriers adopted by the International Air Transport Association which enable Eastern Air Lines, British Airways, National Airlines, Pan American World Airways and TWA to operate. Ways to arrange for delayed aircraft flights over their newly scheduled inter-airline services between the U. S. and Latin America.

ORDERED

Investigation of the United Air Lines 747 crash flight incident that between recent post-crash accident automatically ended.

DISMISSED

Eastern Air Lines' petition to make final the portion of the contract's decision in the National Airlines of Boston Case which would restrict Eastern's "closed door" operations at Pittsburgh on Route 6.

United Air Lines' application for a writ certiorari to suppress the U.S. District Court's order in the case of the applicant.

British National Airlines' application for service to Jacksonville, Florida State Court, to be served in Denver, Colo., at the request of the applicant.

DENIED

Eastern Air Lines' petition for reconsideration of CAB action regarding United Air Lines' temporary route between Philadelphia and Louisville, Ky., on Chicago route.

Two American World Airways' petition for reconsideration and approval of a proposed National Air Lines' route through Chicago, pending O'Hare and Midway Airport are not used on the same flight. Lines to Missouri in the East Detroit service are in City of Oakland, Cal., Air-

Capital Airlines VISCOUNT

POWERED BY  ROLLS-ROYCE

*Rolls-Royce built the first
propeller turbine aero engine to fly.*

★

*A Rolls-Royce propeller turbine
engine was the first to be officially approved
for civil aviation.*

★

*The only propeller turbine engined airliners
in service in the world are powered by Rolls-Royce Darts.*

★

*Rolls-Royce Dart engines have run
nearly 600,000 hours on airline service.*

★

Dart engines are flying over 2,000 hours every day.

ROLLS-ROYCE LIMITED · DERRY · ENGLAND

Airline Traffic—August 1955

	Revenue Passenger Miles (000)	Revenue Passenger Load Factor	U S Mail Ton-Miles	Revenue Ton-Miles	Freight Ton-Miles	Total Revenue Ton-Miles	Per Cent Revenue to Aircraft Ton-Miles
DOMESTIC TRUNK							
American Airlines	489,571	39,095	45.98	1,458,861	1,000,573	2,459,434	90.07
Boeing Airlines	134,489	10,397	38.75	131,448	79,478	210,926	77.18
Capital Airlines	238,022	76,421	38.23	334,900	274,908	609,808	44.42
Colonial Airlines	45,093	15,096	49.14	13,515	3,698	17,213	49.09
Continental Air Lines	21,071	11,071	53.29	54,006	54,452	108,458	43.88
Delta Air Lines	170,034	36,302	60.76	221,923	241,044	462,967	50.35
Eastern Air Lines	512,034	354,950	69.30	801,824	493,393	1,295,217	46.93
National Airlines	88,297	17,290	60.06	174,371	45,517	219,888	59.66
Northwest Airlines	178,617	75,750	64.25	171,293	18,778	190,071	46.82
Northwest Airlines	109,431	30,227	71.73	398,492	248,879	647,371	46.89
TWA World Airlines	344,822	129,489	66.67	1,008,245	717,763	1,726,008	60.71
United Air Lines	542,704	369,638	75.64	1,060,092	1,153,270	2,213,362	43.71
Western Air Lines	105,284	52,000	64.89	195,352	93,677	289,029	58.28
INTERNATIONAL							
Boeing Airlines	3,207	6,838	43.85	83,297	68,872	152,169	46.05
Colonial Airlines	17,498	103	29.24	94	9,681	9,775	39.29
Colonial Airlines	9,074	9,859	66.22	99	3,683	3,782	66.13
Delta Air Lines	5,032	5,150	51.57	7,897	17,095	24,992	45.46
Eastern Air Lines	17,699	94,824	73.44	53,808	47,073	100,881	43.47
National Airlines	9,053	4,717	57.96	7,477	3,080	10,557	49.25
Northwest Airlines	70,027	10,361	63.84	117,064	19,187	136,251	58.21
Pan American World Airways							
Alaska	9,367	17,399	70.88	33,779	477,061	510,840	60.17
Atlantic	10,487	781,713	66.22	608,905	1,457,681	2,066,586	64.56
Latin America	100,071	94,313	76.68	394,172	2,499,292	2,893,464	64.81
Pacific	80,090	60,000	60.00	1,000,000	9,000,000	10,000,000	60.00
Pan American-Grace Airways	11,450	14,244	56.46	30,575	195,011	225,586	55.40
TWA World Airlines	37,440	71,890	79.81	708,685	681,692	1,390,377	71.99
LOCAL SERVICE							
Albany Airlines	37,458	6,025	46.82	7,291	19,001	26,292	48.88
Boeing Air Lines	10,520	5,820	46.51	3,194	7,981	11,175	45.73
Colonial Airlines	6,059	1,946	31.87	3,713	1,049	4,762	31.88
Federal Airlines	10,001	4,769	50.81	15,871	5,692	21,563	46.70
Lake Central Airlines	10,000	1,700	34.00	3,311	17,000	20,311	36.62
Quick Air Lines	82,158	3,438	33.26	7,217	15,128	22,345	35.54
Proflight Airlines	35,743	6,400	53.85	16,000	12,400	28,400	53.50
Seaboard Airways	15,104	5,400	39.04	5,500	10,500	16,000	38.21
Seaboard Airways	37,814	5,451	44.41	6,100	5,500	11,600	46.34
TWA Local Airways	75,413	3,000	37.81	18,000	4,500	22,500	35.90
West Coast Airlines	17,284	3,800	51.46	4,000	2,100	6,100	54.53
HAWAIIAN CARRIERS							
Hawaii Airlines	50,006	7,109	70.80	3,374	197,004	200,378	66.93
TWA Pacific Airlines	37,702	3,213	64.61	858	35	893	58.33
CARGO LINES							
American Baggage					531,077	531,077	41.46
Flying Tiger Line	5,336	3,478	66.11	31,600	4,603,765	4,635,365	72.15
Island Airways	1,590	6,711	76.22	806	3,714,736	3,715,542	78.59
Island Airways					992,589	992,589	66.56
HELICOPTER SERVICE							
H. T. Airways	9,680	53	55.20	1,000	1,204	2,204	50.67
Los Angeles Airways	6,821	20		4,713	1,653	6,366	41.63
Helicopter Air Service (Chicago)				5,688		5,688	47.00

*Not available.

Compiled by AVIATION WEEK from airline reports to Civil Aeronautics Board.

COCKPIT VIEWPOINT

By Capt. M. S. HARRIS



Safety With Sense

Cover the full of the year and advice to pilots blossoms forth on posters, handbills and manuals by the ton. Via notices, entry orders, manuals, orders and forms we are saturated by all manner of instructions aimed at safer flying. All good stuff, undoubted. But the language? Excessively more suited for sixth graders (or the high school English class) than for the pros who faced the same job last year.

The pilots of Aerospace Airlines were recently subjected to a bit of flunking of a different sort. It was written in verifiable language as it got read. This reader found the material worthy of further circulation. Here is AA's Director of Flight, Captain W. W. Russell's memo to his pilots:

"A landing maneuver is not a routine, but a captain's ability may be measured by one captain's ability, measured against another when such maneuvers occur. The best captain is one who operates at all times within his personal limitations, his crew's limitations and his ship's limitations. A captain's limitations may change and frequently do from day to day. The same can be said for the limitations of his crew and the limitations of his ship.

Captain's Limitations

Some of the factors limiting a captain's (or other crewman's) limitations are: (a) physical or psychological factors such as mood, tiredness or overboredness—body needs or fatigue, everybody feeling good or tired; has been too much flying and waiting around, too much going, swimming or working on the line, not enough sleep, too much of most anything. (b) Degree of familiarity with ship's operation (all hands). (c) Degree of familiarity with airport and procedures.

Some of the factors limiting the ship's limitations are: (a) Everything working right, or the timely necessary clear weather in the approach corridor, or a location (or other mental concern) has not been working as it should, or a power plant going trouble, or some part of the navigation or communications gear in the questionable category. (b) The weather situation—turbulence, ice. (c) The runway situation, i.e., slippery with rain, misty or covered or questionable to avoid component.

Another Man's Prison

"So the old saying 'What is one man's meat is another man's poison' really applies to clearing misadventures. Because the trip ahead of you 'gotta' do, does not necessarily mean you must get it, or even make the attempt. The other guy's situation may be considerably different from your own. Thus, of course, there is the matter of rapidly varying color and visibility conditions. (Remember that it that weather reports sometimes do not keep up with the actual weather conditions prevailing.)

"A captain will never be criticized for not going across to an airport, even though the trip ahead and the trip behind him. It is not an approach must be more precise in execution than for ILS or the higher minimum. Use these low minimums when the factors are at your level for sound approach execution. Deconstruct the approach should the degree of position fall short of your expectations as whenever the weather conditions are viewed through your windshield do not mist (a) authorized minimums or (b) your requirements, which are at the highest."

This information is good for several reasons. First, because it was written by a first pilot. Second, because he did not make the mistake of assuming his audience was composed solely of happy little cartoonish dancing around the deck and, Third, it has the courage to be justified. This combination makes the memo speak words that are greater value to every pilot.

Engineers! Join this winning team!

As DOUGLAS you'll be associated with top engineers who have designed the key airplanes and missiles on the American scene today. For example:



A-1 "SEVEN SEAS" America's first, joint service



F-4 "SKYRAY" Only carrier plane to hold verified speed record



C-124 "GLOBEMASTER" World's largest production transport



B-66 Superpropulsion missile oriented to ground air action



F-3H "SKYROCKET" First airplane to break the speed of sound



A-1H "SKYWARrior" Largest conventional bomber



A-4 "SKYHAWK" Smallest, lightest attack land carrier



B-44 Speedy, versatile jet bomber

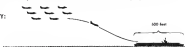


With its airplanes dominating the field from the largest personnel and cargo transports to the smallest combat types, and a broad variety of missiles, Douglas offers the engineer and scientist unparalleled job security, and the greatest opportunity for advancement.

For further information relative to employment opportunities at the Santa Monica, El Segundo and Long Beach, California, divisions and the Tulsa, Oklahoma, division, write today to:
DOUGLAS AIRCRAFT COMPANY, Inc.
C. C. LeYone, Employment Mgr.
Engineering General Office
3080 Cross Park Road
Santa Monica, California

TACTICAL PROBLEM: To design and build a jet bomber able to operate from the smallest World War II "jeep" carriers.

PRACTICAL REPLY:



The DOUGLAS A4D Skyhawk

Designed for the U.S. Navy and now in volume production, the Douglas A4D Skyhawk sets many of the tactical requirements imposed by the higher loading and take-off speeds of modern jet aircraft. The compact attack bomber flies low and faster with a greater striking load

than any airplane of comparable size. . . . compounds many jet options twice its size, but it can fly with ease from "jeep" carriers and short, advanced strips. . . . limited to most jets. . . . No airplane is as short that Skyhawk can be stored in quantity aboard carriers without jacking

in single—its simplification that makes important comparison between right and left. Performance of A4D Skyhawk is another example of Douglas leadership in aviation. General utility with fewer production costs, through highly simplified design, is always a rule at Douglas.

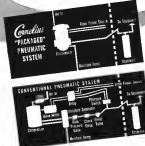


In a Second Fleet—arrives to New York, Washington, D.C.

Depend on **DOUGLAS**

First in Aviation

**In fighters, bombers, aerial tankers,
transports, trainers and helicopters**



COMPLETE PNEUMATIC PACKAGE
 The Complete Compressor, Model 130, 22CFM, 2000 PSI, is used in the Midline unit F2H-3 and F2H. North American F2-3 and F2-4, Citation, Fought F70-3, and Grumman F117. Also on order for the Lockheed P3V, Grumman SFV, Martin P3M, Boeing RC-135, Boeing R33, Boeing T-109, Airborne and Comstar Systems. Thousands of service hours under all operational conditions are proof of outstanding performance.

The Cornelius Model 130 compressor[®] is the heart of the complete Cornelius "peckaged" pneumatic system which includes Inist air filter, starting relay, redline noise filter, moisture separator with automatic condensate dump and heating element, back pressure valve, check valve, relief valve and pressure switch.

Compact Design Saves Space—Entire air supply system occupies only slightly more space than compressor alone in conventional system.

Weight Savings: 5 pounds or more are possible by eliminating separate system components, associated tubing, fittings and face connections.

System Reliability is Assured because each integral component is designed specifically to give maximum performance in combination with the other components.

Time saved by installation and servicing of one unit is another valuable benefit which

The Corbion "packaged" pneumatic systems are available with either DC, AC or hydraulic motor drives. Please write us in order that a Sales Engineer may discuss with you the application of this "packaged" system as well as the many other pneumatic components which we manufacture.

THE CORNELIUS COMPANY 150-396 Ave. N. E., Minneapolis 21, Minnesota

PIONEERS IN THE DEVELOPMENT OF AIRCRAFT PNEUMATIC SYSTEMS

AVIATION WEEK—OCTOBER 17, 1957

[illegible]

A precision ball joint connector
designed & developed by Stylos

PRECISION SHEET METAL & MACHINE PARTS
COMPLETE STOCKHOUSE SERVICE

CEILING STEERING EQUIPMENT



1-800-8-NO-PAIN, 24 HOURS, 7 DAYS, 365 DAYS

AERODYNAMICISTS

★ **New software and systems projects** are springing up in response to the dynamic needs of Marbury Group Inc., America's first company to use the wind tunnel system, design and production of all weather and platform aircraft.

★ If your timing and experience qualify you for one of these challenging assignments, please telephone us now to reflect

Mr. Robert Hinger
Manager of Engineering
Industrial Relations
Northrop Aircraft, Inc.
Northridge, California

* Expenses free. Los Angeles veterans will be assisted by qualified applicants.

NORTHROP AIRCRAFT
INCORPORATED
BANTONVILLE, CALIFORNIA

Every Five Seconds

"Every five seconds day or night an aircraft is taking off for a regularly scheduled flight somewhere in the world." This theme of a booklet published jointly by the International Air Transport Association and the International Civil Aviation Organization provides a dramatic measure of the progress achieved in air transport during the past decade.

The scheduled airlines of the world are now carrying 25 times as many passengers as they did before World War II plus 70 times as much cargo and a thirteen-fold increase in mail. About 15% of current world airline traffic is carried by the 74 airlines flying under 40 different flags that have voluntarily banded together in the International Air Transport Association. Today IATA began its Youth Anniversary General Meeting at the Waldorf Astoria Hotel in New York under the presidency of Juan T. Trippe, a pioneer of international aviation and president of Pan American World Airways.

Delayed Honor

IATA embraces all kinds of airlines from globe-girdling giants such as Pan American, BOAC and Air France to tiny operators such as Cyprus Airways and Flyingfish Airways of F. of Ireland. It also has no political distinctions. The Communist Czechoslovak Airlines (CSA) is a member although Russia's Aeroflot has not joined.

Juan Trippe's presidency and New York's playing host to IATA are long-delayed honors. Mr. Trippe was elected president of IATA's general conference, the International Air Traffic Conference, in 1918, and New York was scheduled as the annual meeting site for the fall of that year. Outbreak of war in Europe cancelled those plans which have waited until now for justice. Actually this is the second time post-war IATA general meetings have been held in the United States. San Francisco was the site in 1950 when Warren Lee Patten, board chairman of Trans-World Airlines, was president of IATA.

IATA can look back on a decade of solid achievement since its first post-war meeting in Havana. Perhaps the most significant is the fact that these national flag carriers have voluntarily spun their routes into an international network that enables an air traveler to ship or to arrange a trip or cargo shipment to any of the 1,500 cities on the air transport map with a single ticket. IATA activities revolve in a dualism of routes and around the globe. The so-called "spine of Geneva" prevailed in its concept long before it became a popular international political doctrine.

Although international air traffic is increasing steadily, the future outlook for operating airlines is not universally

rosy. As Sir William Hildred, director general of IATA, emphasized in his annual report, the squeeze of rising operating costs against total airline revenues poses the greatest problem for healthy economic growth of the air transport industry.

Airline Problems

The air traffic control problem, already acute in the United States, who is an international problem. Unless the individual governments face up to their responsibility in providing adequate navigation and traffic control facilities, there will be serious limitations on traffic volume and severe economic penalties as use of new, technically improved post-1950 aircraft already in prospect for international routes.

Governments, Sir William indicates, are a major contributor to rising airline operating costs through imposition of new taxes such as taxes charged for airport facilities, higher airport landing fees and transportation taxes. Here IATA and its member airlines face a bitter battle if they are to prevent tax increases from further lacking away at the present narrow 3% margin of total world airline operating profit.

Future Growth

Future growth of international air traffic lies clearly in two directions:

- Continued expansion of the tourist trade. Nearly 70% of the 1956 record total of 550,000 North Atlantic air travelers flew as low-cost tourist travelers and their volume exceeded by 80,000 passengers the total North Atlantic traffic of only four years earlier. The growth of low-cost service and the promise of tourist travel represent the greatest single area for international air traffic growth in the immediate future.

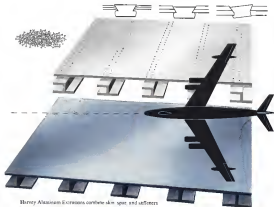
- Establishment of efficient international air cargo service. Air cargo offers its greatest dividends to shippers on long hauls and cargo aircraft first offer economical operations are now beginning to fly. This field offers a downer side of growth as the immediate future but a long term potential for an extent of possible passenger traffic expansion. In expanding air cargo operations, the natural walls of air type present more formidable obstacles than sides and operation problems.

In the long light to make with international travel economically attractive to the people of the world and to make necessary national barriers to the free flow of people and goods, IATA and its member airlines are making an enormous practical contribution to the cause of international understanding and peace.

—Robert Hutz

Harvey extrusions...
simpler, smoother
parts for better
flight

Improperly installed rivets and bolts have always contributed heavily to the turbulence and drag that downgrade a plane's overall performance. On light-plane skins, dimples result; on medium skins, rivets can be conspicuous, but often end up below the desired surface; the fast bolts used on heavy skins just can't be drilled to surface smoothness.



Harvey Aluminum Extrusions combine skin, spar, and stiffeners in large panels, visually eliminate rivets and bolts, thus achieve a degree of invisibility smoothness that reduces operating costs and improves performance. And in the same skin, assembly is faster, sealing is eliminated, and inspection is simplified.

Harvey is a leading international producer of aluminum extrusions in all sizes and all sizes. Special extrusions, special designs, medium sections, extrusions, rivets and bolts, bearing stock, pipe, tube, special products, aluminum alloy materials, products and related products offer similar products in other areas and change in application.

MAKING THE MOST OF ALUMINUM... FOR EVERYONE

HARVEY
Aluminum

HARVEY ALUMINUM EXTRUSIONS, INC., FOLSOM, CALIFORNIA—BRANCH OFFICES IN PRINCIPAL CITIES



AMERICAN AIRLINES

America's Leading Airline

chooses Allison Turbo-Prop Power for 400-mile-an-hour luxury travel

New Lockheed Electras to give America the world's fastest, smoothest flights

AMERICAN AIRLINES has ordered Allison Turbo-Prop engines to power its new fleet of Lockheed Electra four-engine airliners to give America the world's finest air travel.

The Allison Turbo-Prop engine was chosen because it is the most advanced propeller-type aircraft engine available here or abroad — and the first Turbo-Prop to receive Civil Aeronautics Administration approval for commercial service.

The Lockheed Electra has been specially designed to take advantage of this new concept in aircraft power, and represents another major advancement in air transport.

These great new 64-passenger airliners will fly at speeds of more than 400 miles per hour—saving up to an hour on popular flights. They will operate from any airport now served—with much shorter take-offs and landings. And they will bring remarkable new standards of smoothness

and comfort to air travel. These new luxury airliners are scheduled for delivery in 1958.

General Motors salutes American Airlines on this important step in continuing the advance of American aviation—and we are proud of our contribution to the progress of American-designed and American-built aircraft.

ALLISON DIVISION OF GENERAL MOTORS • Indianapolis, Indiana

The Allison Turbo-Prop engine is backed by more than six million hours of turbine engine flight time—experience where it counts most—in the air!



AMERICAN BUILT FOR THE NEW ERA IN AIR TRAVEL